The Builder.

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Etching and Popular Taste.

THE proposed formation of a society of etchers, mentioned in our last, is a natural result of the gradual progress of his art in England of late years, while at the same time it does not come at all too soon in regard to the desirability of making the outer world better acquainted with etchers and etching in England. In modern days the art of etching has been till very recently an unfamiliar form of art in this country. Its home has been chiefly in France; and so little has it been publicly recognised and understood on our own shores, that there are still to be met many people, not uneducated, who will apply the term "etching" to mere pen-drawing on paper, without any idea that they are confounding terms, and applying to a very ordinary process of amateur amusement the term properly belonging to a very delicate form of art, needing above most others the artistic spirit and the artistic hand to evoke its highest qualities, or even to make much of it at all. Nothing surprises such persons more than to be told peremptorily, as they are sure to be told if they are in the company of an etcher or an amateur of etching, that they are giving to an ordinary pen-drawing a title to which such a work, however elaborate, has no right; and nothing (naturally) annoys etchers more than to hear the proper name of their art misapplied in this way.

We need some decisive action by which the peculiarities and powers of this art may be brought more home to the public mind. Mr. Hamerton's valuable and very complete work on the subject furnished the means, some years ago, for every one who wished to acquire some knowledge of it; but such a book was not likely to be sought out and read except by those who already had some interest in the art, and wished to know more about it, or to follow it up practically. For a considerable time past etching has been a favourite means of illustration in one or two art-periodicals, but these are periodicals themselves addressed chiefly to the artistic and amateur circle, and finding their readers chiefly in that circle. Those who were well acquainted with the *Portfolio* and *L'Art* must often have been surprised to find how entirely unknown these two publications were to readers accustomed to depend for their artistic reading and illustrations entirely on some of the older and long-established periodicals which have done such good work in their day, and commanded such a large and popular circulation. This result may be partly attributed, it must be said, to a want of sufficiently broad sympathy in the tone and style of the new artistic publications themselves. They have, and the *Portfolio* at starting had still more than it now has, the air of being addressed to and representing the views of a limited artistic clique. Like the clergyman who had reduced his congregation to half a dozen, but consoled himself with the thought that those half-dozen at least were "sound," these publications had the air at least of assuming a specially esoteric character, and of being satisfied with the attention and encouragement of those who concurred in their views. It is partly, we imagine, owing to this that, in spite of the really rather large use made of etching in the illustration of these periodicals, and in spite of the not infrequent occurrence of small exhibitions of etchings in London, there is still, in the minds of many persons, a vague idea of a kind of artistic mystery surrounding the art; and while they are willing enough to go to exhibitions of oil-paintings and water-colours, and fancy themselves fairly able to judge of these, they turn away from an exhibition of etchings as of something peculiar and only half comprehensible, and which they regard very much as a man who is not *au fait* in the mysteries of old china and its value would regard the collection of a connoisseur in such things. He has no doubt the collection is valuable and interesting to those who have studied china, but he does not pretend to know anything about it; and etching falls into the same kind of category. At the time when the small but extraordinary collection of works by Méryon was exhibited at the Burlington Art Club, we remember being asked by a worthy man with no pretensions to special artistic culture, who had just been visiting the collection, if we would be so good as to explain to him what were the qualities for which these etchings were so much admired and talked about by critics. The question was asked not in any spirit of scepticism: the inquirer, like Miss Rosa Dartle, merely "wanted to know"; but what answer could be possibly given to such a question?

The comprehension of this or any other form of art by persons of general and not special culture is, in fact (granting, of course, some inherent capacity for understanding it), the work of time and habitude, and observation, rather than of any definite teaching. What are the mechanical means employed in etching may be easily related and understood; but the appreciation of a form of artistic work unfamiliar to the mind can only be arrived at after seeing a good deal of such work, thinking about it, comparing different specimens with each other, comparing the aggregate of its productions with those of other forms of art. For the appreciation of any class of art, there is no education like constantly seeing a good deal of it in its best and also in its less meritorious forms: for which reason we have always advocated the opening of collections of art as much as possible to the middle and lower-class public, and the formation of public galleries of art wherever possible. Granting these, education, to those who are capable of it at all, comes almost of itself, though not at once. Many who have not paid much attention to pictures till past the earlier years of their life, could probably remember how completely, though almost imperceptibly, their tastes become modified and refined upon year after year. What strikes the eye and the judgment at first is what is obvious and on the surface, what appears to show facility and finish on the part of the artist. Gradually the spectator comes to see that what at first took his fancy is after all superficial, that it is easily done and often repeated, that it is very possible to tire of it; gradually he finds out that works which have seemed uninteresting, peculiar, or repellant at first sight, really represent much more thought, a much more considerate use of means to an end, than those which commended themselves to his untrained taste. By degrees he finds out, from repeated exhibitions, what are the higher capabilities of the art as a mode of intellectual expression, what are the mere sleight-of-hand effects, which, once learned, can be repeated again and again, losing value with each repetition; and even in regard to mere manipulation, he learns to distinguish between that which is carelessly though showily done, and that into which the artist's whole labour and effort has gone. Thus by degrees a taste is formed, and a firm ground of judgment which is little liable to be deceived in the future.

Through this kind of spontaneous training a certain portion of the public has gone, for some time past, through the medium of our now numerous annual exhibitions. But through this training very few people indeed have as yet gone in regard to etching. It is still an art in regard to which there cannot be said to be any public opinion at all as yet. And the formation of such an opinion is one good result which we think may be contributed to by the action of the proposed Society of "Painter-Etchers" (about which term a word just now). The formation of the society, as we stated last week, is to be preluded by a general and representative exhibition of English etchers' work, as a means of selection of the most eligible members for the proposed society; and the society, when formed, and if successful, will no doubt hold annual exhibitions just as the Academy and the Water-Colour societies now do. While the very fact of the formation of the society will be a step towards a proper assertion of their own position in the art world by the etchers, the great opportunity which it will afford for publicly and continuously illustrating their art by exhibitions will, in itself, go far to create that more general and public appreciation of etching which can hardly be said to exist at present; it will furnish the means of a fresh

step in the artistic education of the people. We wish the movement, therefore, all success and support.

A word, as before said, as to that phrase "painter-etcher," and its significance; for it has a significance, though it is an awkward term, which would be better dropped when it has served its purpose. That purpose obviously is to draw attention to the fact that etching is something more than a medium for reproducing drawings for the purpose of illustration. We have spoken of the introduction of etching in certain publications as a favourite form of illustration; but it must be said that this is not the kind of object to which it best lends itself. In fact, impressions of etchings, properly so called, can only be used for illustration in publications which are limited as to number, and in which the appearance of a special illustration by a special day is not an object of invariable necessity. Etching is the slowest and least certain form of engraving in regard to printing copies; the one in which there is the largest percentage of faulty impressions, and in which the greatest care is required to insure successful printing. It cannot be reduced to mechanical certainty; each act of printing demanding special individual care, the impressions often varying considerably even under the same hand. But it is desirable that the public should understand that etching is not to be classed with other forms of engraving as a mere means of reproducing and multiplying a work of art. It has that value to a certain extent, and very refined and beautiful reproductions of portraits and other paintings have been made by eminent etchers, copies of which have a special value not only from their intrinsic merit of execution, but because their multiplying power is much less than that of an engraving. But the special point of the revival, as we may term it, in favour of etching, is, that it is a return to the time when engraving, of whatever kind, much more often employed the hand of the original artist, and embodied an original thought, than it has in the period when it has been chiefly valued as a means of multiplying copies. Engraving, however it may be susceptible of the hand of a master in art, has more usually employed the hands of art-craftsmen than great artists; it is a process involving too much of what is, at least, semi-mechanical for a great artist to devote his time to it. But it has immense value as a means of reproducing copies in great numbers, and in a permanent manner. Etching would never compete with it in this way. Etching is revived for its own sake, as a medium for the expression of original artistic thought, coupled with the advantage of the capability of a limited reproduction of copies. Hence the term "painter-etcher" emphasises the fact that those who are now bent on reviving this art are taking a stand according to which they must be classed with painters, not with engravers. The art has peculiar beauties, facilities, and delicacies of tone and expression completely its own, and its productions may be works of entirely original power and design, to be valued as original works of art, and not as reproductions. The same stand might be taken by engraving, as we said not long since in speaking of Bewick's engravings; but there is the drawback that the mechanism is too laborious in proportion to the result to attract artists of the highest class. This is not the case with etching, which does not demand labour, but knowledge of what to do and how to do it, and above all true artistic and poetic feeling, without which it is but copper-scratching. For this very reason its more recondite merits are less easily "understanded of the people" than those forms of art in which execution is carried to a higher degree of finish and realism, and perhaps the due appreciation of a fine etching may be said to be the most delicate test of artistic taste and culture, as it demands from the spectator not only that he should see what the draughtsman has done, but that he should understand also what he has intended to convey beyond what is obvious on the surface. Some enthusiasts among etchers and critics may have a little exaggerated their favourite subject, but there is no doubt that the more popular understanding of a form of art like this cannot but exercise a refining and quickening effect upon popular taste.

The Edmonton School Board have appointed Mr. A. R. Barker, of 11, Buckingham-street, Strand, London, to be their Architect.

THE CAMPAIGN AGAINST PREVENTIBLE HUMAN MISERY.

FEW things contributed more effectually to the widespread and permanent power of the Church of Rome, some four or five centuries ago, than the aptitude displayed by her rulers for absorbing those independent forces which, if left to their own unguided energy, would have become in time arrayed against each other, or against the Papacy. This has been especially remarked in the case of the great monastic orders. A hard and short-sighted policy would have entirely arrested the great source of power that developed the mighty confraternities of the Dominicans and the Augustines, the learning of the Benedictines, and the special science of the educational ecclesiastics. In the great struggle of the present day against the physical evils of life, against all that tends to produce squalor and disease, or even against the mischief arising from ignorance and from poverty, it should be especially remembered that those who are not against us are with us. So vast is the field, and so great are the benefits which it is hoped to secure, that the aid of the enthusiast is not only to be accepted, but welcomed. There are few of us in whose veins the blood runs with such measured beat as to allow us first calmly to inquire into what is the teaching of science, and then, with equal composure, steadily to set ourselves to carry it out. On the contrary, it is men who are full of the spirit of the reformer to whom we must look to overcome the vast inertia, which, even more than open and direct opposition, arrests the progress of sanitary and physical improvement. We may not agree with them altogether. But the point is to ascertain not where we differ, but where we agree. We may think that A rides his hobby too hard, that B looks at symptoms rather than at the evils which they betoken, that C puts the cart before the horse. But admit all that, and then there remains the truth that the resultant of the energies of A, B, and C is a force operating in the right direction. And that being the case, it is our duty to offer to each, so far as we honestly can, comfort and aid.

We have two or three of these independent energies now at work to which these remarks apply. There is that effort at providing a more nutritious bread for all classes, the importance of which was, long ago, suggested in these columns, and to which we had occasion recently to call attention (see *Builder* of 11th Dec. 1880, p. 691, "Staff of Life"). There is the effort to obtain respirable air in London in the autumnal and winter season, which called together a large and influential meeting at the Mansion House on the 7th instant. And there is the attempt to organise a sort of Guild of Health, so to speak, or association for mutual aid in the sanitary inspection of dwellings, which occupied, first the energies of a committee at the Langham Hotel, and then, at other instigation, the attention of the Society of Arts, on the evening of the 12th instant, under the presidency of Professor Huxley. We do not mention these as the only, or even as the chief, of the independent efforts to which we have referred. But they are instances which came before us within a few days,—instances in which earnest and disinterested people, without hope of fee or reward, are setting themselves to do their best to remove the evils arising from ignorance, from prejudice, or from neglect. Not only do we wish them good speed, but we are anxious to give them that encouragement which can hardly fail to result from the conviction that all these independent workers not only march under the same flag, but are, in truth, engaged in different operations which are to be combined in the same campaign,—the campaign against preventible human misery.

The remarks made by the *Times* on the Mansion House meeting, touching smoke and fog, while fairly giving a sketch of the general subject of the discussion, contain nothing that will be new to our readers, if we except the conclusion that "to drain London was a more gigantic work than to clear the air of London promises to be." We should be very glad if we could subscribe to any such encouraging assertion. To drain London was a question of pounds, shillings, and pence. It included, indeed,—or rather we should say, the still unsolved problem includes, the solution of a question towards which but little progress has been made in the last decade, namely, what to do with the offensive matter removed. It is, we think, certain that it is no proper reply to that question to say, "Pitch it into the Thames"; nor do we consider that the removal of such a disgrace to our civilisation as that method presents can be anything but a question of time. But apart from this yet unsettled difficulty, the question of drainage was simple. From a mechanical point of view, it is merely a question of hydraulic action, with the principles of which the engineer is fully familiar. From a social point of view, the main difficulties had been long removed before the Metropolitan Board of Works commenced the work of the main drainage system. There was no need to ask for the aid and help of every householder. The work to be done was, for the most part, without the houses, and every owner or occupier was only too glad to have the advantage of an outfall into the sewers afforded to him.

With regard to smoke, the case is quite otherwise. The scientific part of the question is far from being clear. We have called attention to the elegant theory that each particle of water in the foggy air surrounds itself with an envelope of smoke, or of some of the elements of smoke. Another observer comes forward with the theory that particles of dust form the fog *nuclei*. Another theorist would draw down pure air from a region of the atmosphere at some height above the canopy of smoke. We do not mention these matters as undeserving of attention, but as showing how far we are from a thorough appreciation of the scientific problem of the actual formation of the special fogs of London, and of the mode by which,—expense being put out of sight,—they may be, if at all, prevented.

The social question, however, is one of far greater difficulty. How difficult it is, let any one of our readers who doubts take this method of measuring. Let him ask the first dozen housekeepers he meets their opinion as to the advantage of doing away with open fires. Let him speak of the good of all, to be attained by a little sacrifice of them on the part of each. Let him touch on the economical question,—the cost of smoke, the waste of fuel, the waste of heat when produced from the fuel, the cost of washing, the medical charges, the cost of apparel and furniture,—all those points to which, on a former occasion, we have endeavoured to attach an approximate money value. What will be the general reply?—"Yes, but we cannot give up our open fires." As long as that *is* the general reply, reform has a very uphill task before it, unless science show how the fire may be retained and the smoke avoided.

It is this æsthetic objection,—this immobility of habit,—which is the chief obstacle to the purification of the London winter atmosphere. It is highly desirable that all those who aim at this great object should bring this fact clearly into the centre of their field of vision. As to cost, we have no doubt whatever that economy is on the side of reform, and that a great economy. We do not say that a great economy is attainable to-day or to-morrow, by the combustion of the gas of the gas companies as fuel, although even as to that we have previously brought forward some very striking figures. But we do say that the first requisite to prevent smoke is to burn smokeless fuel; and that if once it is felt that the public will use the cheapest mode of producing heat without smoke, science will soon provide them with such combustible matter as will combine the maximum of purity, the maximum of heat, and the minimum of cost. But for that to be done, the sort of family affection entertained for the blazing fire may have to be sacrificed. Here the shoe pinches. Say what we will, it is wasteful, dirty, costly, clumsy; it turns day into night. It lets you shiver as you get up, shiver as you go to bed. It is dangerous if left in, dangerous if raked out. It has every defect that a source of heat can have except one,—it gives a cheerful blaze. So long as that cheerful blaze is regarded with the same affection that one entertains for a fascinating companion, into whose pecuniary or other demerits we do not care too closely to inquire, the efforts of the smoke-reformer will be paralysed. It is not the engineer who is at fault,—it is not the chemist. Give them more encouragement, and the smoke of London will soon become a vanishing quantity; but science and economy are both mute before the love of a cheerful blaze.

The drawing-room fire, we take it, is the main defence of fog. The products of manufacturing chimneys have been to some extent amended, and no doubt improvement here is in progress. In the bedrooms and dressing-rooms,

when the weather renders fire almost a necessary, the perfect manageability of gas will, we think, render its adoption more and more the rule. As to the nursery fire, we must almost rank ourselves among the obstructives. Only on receiving the assurance of the most perfect ventilation, could we consent to the abandonment of the open fire in the nursery. And here let us bear in mind that a double system of ventilation is a necessity for the healthy use of gas in the dwelling-house. We require that the gas should be supplied with the exact amount of oxygen necessary for combustion,—neither less nor more,—as a condition of economy. This involves burning the gas in a closed system of conduits, to supply the air, and to remove the products of combustion. Nor do we think that gas ought to be burned in human abodes, either for light or for heat, unless the products of combustion are quite prevented from coming into the air of the apartment. This also is demanded by health. Plants will not live in a room in which gas is openly burnt. Are the lungs of children less sensitive than the leaves of plants? But this double need, economical and hygienic, for a closed system for gas combustion, involves the need of a separate system for ventilation. It will no longer do to trust to the cracks of doors or the loose joints of windows to remove the products of respiration. Glazed tubes must be built into the walls, and ventilators attached, and the ingress and egress of air to the living-room must be made matter of definite care, if we would at the same time burn gas and preserve health.

The kitchen fire, we take it, produces about half the smoke that comes from the ordinary dwelling-house. As to the kitchen fire, we can offer an immediate remedy,—one of which we can speak from long personal experience, and one which is remarkably free from countervailing objections.

The kitchen fires of Pembrokeshire, Carmarthenshire, and some other parts of Wales are fed with culm, or the natural dust of anthracite coal, which may be seen in veins cropping out on the surface of the ground in the natural sections afforded by the shores of St. Bride's Bay, and in many adjoining districts. Of all coal this is the cheapest to win. It is about the purest to burn of any coal. It is quite smokeless, and yields as much heat as the best bituminous coal.

The mode in which it is burned is this. The culm, or coal-dust, is mixed with clay, in a mode similar to the mixing of mortar. The mixture is made up into balls, roughly rounded by the hand, and left under cover to dry. Persons who are very neat often whitewash these balls, which are from two to three times the size of an orange. The kitchen fire, which is never extinguished, is built up, or, as it is called in Pembrokeshire, "stummed up," with these balls in the morning, a certain time being allowed for the attaining of the maximum heat. The fire is built over the top, like a dome, with these balls, and one or more spiracles are left, from which a bright tongue of intensely fierce flame flickers upwards. The ordinary "poking the fire" is unknown in these culm fires, but, with proper experience, any kind of heat that the cook may require is to be obtained. Any grate will do,—the rudest construction as well as the most complex. All that is required is knowledge of the fuel, and a little forethought to know where the chief heat is to be developed, maintained, or lowered down. There can be no reason why culm fires should not be introduced into London at once. Kitchen smoke would thus be obviated. Of course, the cost of the culm would be more in London than in Pembrokeshire, but it ought not to be very high.

The *per contra*, to give every one his due, is, that there is a large amount of ash, in proportion to the coal burned, as it arises, not so much from the coal itself, as from the clay with which it is mixed. But even notwithstanding this, we apprehend that the ash to be removed in twenty-four hours from a Pembrokeshire fire would be less than that produced by a bituminous coal fire, that performed the same amount of cooking. The other evil is due to the purity and perfect combustion of the smokeless coal. It is the large amount of carbonic acid which is the product of combustion. The presence of this gas shows, indeed, that the coal has done its work thoroughly. But as it is invisible and heavy, it is apt to escape into the room, and care should be taken not to sleep in a room with a culm fire, unless there is very proper care exercised as to ventilation.

We can speak from long experience as to the convenience, economy, comfort, and smokelessness of the Pembrokeshire culm fires. We recommend those of our friends who are now seriously grapplingwith the problem of London smoke to take a ticket for Carmarthen, or Haverfordwest, and to spend a few hours in the study of the combustion of culm. We think the result would, in many cases, be the diminution of the coal-merchant's bill, and the discontinuance of kitchen smoke, with the additional comfort of water always on the boil. Of course, to secure all these advantages it is necessary to propitiate the genius of the kitchen. And without Welsh servants are imported with the Welsh coal, we do not attempt to undervalue this preliminary difficulty.

The drawing-room fire question, which we feel convinced is the chief problem in the smoke reform, is solved in the countries where culm is burned in the kitchen in a delightful way. There is no ordinary bituminous coal in the culm districts. Where a bright blazing fire is required, if wood is not used, the fuel employed is cannel coal. This is the very poetry of open fires. As smokeless as anthracite, if pure, it stands at the other end of the scale of coals, having a comparatively small percentage of carbon, and a large excess of hydrogen. The Wigan cannel yields only 2·55 per cent. of ash to 83·75 per cent. of carbon, 5·66 per cent. of hydrogen, and 8·04 of oxygen and nitrogen. The only objection to this coal is the cost. It is obtainable in London, being used by some of the gas companies together with Newcastle coal, when a higher illuminative power than the ordinary 16-candle gas is required. The cheapness of the culm used in the kitchen allows of a little extra cost being incurred for the consumption of cannel in the drawing-room in the good houses of South Wales.

The meeting at the rooms of the Society of Arts was held with the object of establishing a Sanitary Protection Association for London. The object of the Association is the provision, at moderate cost, of sanitary advice and supervision, in the first place, for the members; and, in the second place, for those poorer persons in whose welfare the members are interested. The Council of the Association is to be unpaid, and the officers are to have no interest in any patent or remunerative scheme. As this association is purely voluntary, it may be objected that it does not meet the real want of the case, which is the compulsory inspection of the premises of those who do not take enough interest in the matter to pay any attention to sanitary requirements. But we ought not to overlook the good effect of example, and this association will not only set good examples, but it will do something more. Just as neglect and dirt establish *nuclei* of pestilence, so do proper care and attention establish centres of cleanliness. The general character of a neighbourhood in which such an association took root would be changed. Improvement would manifestly spread with the spread of the association, and the rate of the doctor's bill would palpably fall. Under these circumstances is it too much to anticipate that the good example may prove contagious, and that those who come to sneer may go away to imitate? For each of these efforts there is ample room; who shall say which is most needed? Is not bad bread, of an artificial and dangerous whiteness, a greater enemy to health than even a canopy of smoke? Is the winter blackness of the fog a greater or a less evil than the invisible sewer gas, that creeps with deadly silence into a house turned spick-and-span new out of the hands of a builder, who has done a good stroke of business in being his own architect, and thus saving not only 5 per cent. commission, but perhaps another 10 or 20 per cent. in scamping? Saved, do we say? But at what cost?—at whose expense? At that of the future tenants. Robbed would be a better word than saved; or, if there be a more appropriate expression, it is one that will include a sense very closely approaching that of the word murder. Very little, if at all, short of the guilt of murder is that scamping of the arrangements for the removal of refuse from the dwelling-house which allows of the generation or entrance of sewer gas, and its twin-born children, typhoid fever and diphtheria.

The Institution of Civil Engineers.—At the ordinary meeting on Tuesday, the 11th of January, Mr. Abernethy, F.R.S.E., delivered an inaugural address as president, treating mainly of canals and docks.

DRAWINGS OF ANCIENT EMBROIDERY.

OUR opinion of this work* depends, in some degree, on the point of view from which we are expected to regard it. If we regard it as a collection of illustrations of curious and very interesting specimens of ancient embroidery, not very easily accessible, here brought together in a convenient form for those who cannot see the originals, it deserves the highest praise. The drawings are so beautifully and carefully executed, not only in regard to the form and colour, but even in great measure indicating the texture and execution of the original work, that they may be regarded as very nearly equal in value, for the purposes of study, to the originals. In this respect the book, on the first glance, speaks for itself. The lady who has executed the drawings here reproduced has obviously brought to her task the greatest patience and minuteness of observation in conveying faithfully all the characteristics of the work which she has illustrated; and the examples given in the thirty plates are of the greatest archæological interest, while the execution of the coloured plates does equal credit to Messrs. Kell, the lithographers.

If, however, we are to be expected to look upon the work as furnishing the modern executant of church embroidery with models for study, which is the idea conveyed both by the editor's brief preface† and by the note to the publisher's advertisement, describing the book as "of great use to embroiderers, artists, and manufacturers," in that case our verdict must be given with a difference. There are some remarkably fine bits of decorative work in the book; those, chiefly, which represent the treatment of conventional foliage. The subsidiary ornament on plate 7; the floral ornament on plates 8, 11, 13, 15, 17, and some other bits of the same nature, are admirable examples of some of the finest qualities of decorative design, in regard to boldness of treatment and richness of colour, and the relation of the design to the character of the material in which it is executed. But if we turn to the figure-subjects illustrated, we can only say that, highly interesting as they are archæologically, they are utterly unsuitable to be put forth as models for study in days when people have learned, or at all events may learn, to treat the figure in decoration with some regard to the requirements of drawing, anatomy, expression, and such other trivial considerations. Here we have apostles with their heads twisted nearly off, Madonnas as grotesque as the figures on a Chinese tea-chest, and much more expressionless; cherubim that suggest the idea of newly-hatched chickens. It is ridiculous to speak of such designs as being valuable for study, except in regard to some details of the accessories connected with the figures. These things were done in a day when figure-drawing was almost at its lowest ebb, and in a medium in which it is difficult for the best draughtsman to deal with the figure successfully. Those who produced them did them as well as they could; they did not intend to be grotesque, they worked seriously. But to reproduce the same style of thing now would not be to work seriously. It would merely be to substitute for the difficult task of creating beautiful forms the much easier one of imitating ugly ones, and calling them beautiful because they are imitations. It may be said that the theory of church decoration, among those who at present give most encouragement to it, is to be as antique as possible,—to give to a modern-Mediæval church as much as possible a modern-Mediæval embellishment. If so, there are, no doubt, fit models for the purpose; but if that is what modern church decorators are content with, so much the worse for church decoration.

It is a question worth considering whether it is wise at all to introduce figures into such work as embroidery. It has recently been tried on a large scale, and mainly in outline work,—in designs by artists who draw the figure well; and there is no doubt that on a large scale the material is more manageable for the representation of form and expression, and the treatment in outline gets rid of the almost insuperable difficulties in the way of anything like surface-modelling of limbs or features,—the latter especially. But, then, such a treatment loses, to a great extent, what is generally one of

* Some Drawings of Ancient Embroidery (thirty specimens), by Mrs. Mary Barber. London: Henry Sotheran & Co. 1880.

† Mr. Butterfield undertook to see the book through the press, after the decease of the author, and has added a brief preparatory note in recommendation of it.

the special objects of embroidery,—the production of a rich decorative effect in colour. All the fine effect in the specimens shown in this book is produced by decorative detail alone. One figure design, which is to some extent exceptional in the book,—the kneeling angel on plate 18,—owes all its fine effect to the treatment of the drapery and the wings, the face and the drawing of the hands being just sufficiently good not to impair the effect of the whole much. This figure is taken from the "Funeral Pall" belonging to the Fishmongers' Company. In the centre group from a hanging now in the Church of St. Thomas à Beckett, at Salisbury, and representing "The Annunciation" (plate 25), there is more freedom of pose in the figures, and something more like discrimination of character and expression, than in any other of the figure subjects given. The general decorative effect of the whole is very fine.

What is particularly well illustrated in this last, as well as in some other of the examples, is the production of breadth of effect, combined with richness of detail, by the excellent distribution over the surface of a number of only half-connected bits of decorative design, which are so evenly dispersed as to have collectively something of the effect of a continuous diaper, while, at the same time, they leave considerable spaces of the ground to be seen, and do not interfere with that free and unrestrained effect, quite the opposite of hardness or symmetry, which is the proper characteristic of embroidery. In a method of work in which it is nearly impossible to make rigidly straight lines, true curves, or exact symmetry, the less appearance of any attempt at them the better. Even the fine floral designs, given in some of the plates before referred to, would have been still better if they had not aimed at bi-lateral symmetry, as most of them do. Embroidery should wander at its own sweet will; it has no affinity with precisely divided spaces, and symmetrical repetition on either side of a centre, except in regard to the general arrangement and balance of the whole.

The book is one which any decorator or worker in embroidery may be glad to have. It is full of hints. The floral designs may suggest to him (or her) what to do,—the figures what to avoid. To the archæologist it has a value without any drawback, and had the book been put forth ostensibly as a contribution to the illustration of Mediæval art, and that only, our recommendation of it would have been without reservation of any kind.

THE REPORTED MINERVA OF PHIDIAS.

THE latest news from Athens considerably diminishes the value of the recently-found statue of Athene or Minerva when compared with the description originally given to it by the Mayor of Athens. It appears that some improvements were being made in a narrow lane or street, hardly twelve paces broad, and lying between a row of houses on one side and the Barbakion Gymnasium on the other. In the course of the excavations, at a depth of hardly 50 centimètres, or about 20 in. below the surface, the workmen came upon the ruins of an old Greek house. On the walls the red ground painting, which was divided into fields by half columns, was in an excellent state of preservation. A few paces from these remains, and about 4 in. deeper, the statue was found, lying face downwards. The object was at once carried to the Mayor's house, which was close by. The rumour spread rapidly that a statue had been dug up which was not only a work of art of the first order, and of most excellent material, but,—fortunate omen for the coming struggle,—it was at the same time an Athene (Minerva) with the figure of Nike (Victory) in the hand. On examination, however, it turned out that the statue was imperfect. Besides some other missing fragments, the head of the Nike was not found. The statue itself is of splendid Pentelican marble. Inclusive of the socle, of 6 centimètres, it stands 96 centimètres, or 37·79 in., high. All the archæologists in Athens agree that it is a copy of that statue of Athene which Phidias produced in gold and ivory, and which in ancient times stood in the Parthenon. It is calculated that the statue now found was produced in the first century of the Christian era. On the helmet, in correspondence with the original, there is in the middle a resting sphinx; on the right and left of this is a griffin on each side, and on the right and left of each of the griffins, an eagle's wing. The sphinx has a crest, and the griffins have smaller crests. The head of the sphinx had been broken off, as also had the griffins' and eagle's wings; but, with the exception of the griffins' heads, all the fragments were recovered. The missing griffins' heads are believed to have been eagle-heads. The countenance of the statue is not very savage in expression. The profile is very beautiful. The mouth, however, is large, and the parts about the mouth are not well executed. On the helmet some red lines are still visible. The hair falling down from under the helmet, over the brow and on to the breast, shows traces of yellow colour. The eyebrows were reddish-brown; while the pupils of the eyes were coloured blue, the right eye still preserving the colour very clearly. The *chiton*, or under-jacket, reaches down to the feet, while the *himation*, or outer cloak, is gathered up by a girdle that ends in two snakes' heads. Over the shoulders, and reaching half down the back and bosom, is a scale coat of armour. Behind it shows no ornamentation, but in front, in the centre, is a Medusa head, still showing traces of red colour. The left arm of the statue, which seems somewhat too long in proportion, holds a shield resting on the ground. In the middle of the shield there is a winged Medusa head, with traces of red colour. On the outer edge of the shield a piece had been broken off, but has been recovered. Between the shield and the figure is a serpent, which is standing up in spiral fashion, half as high as the statue. The serpent's head is yellow, its stomach red. The right arm of the statue, which was broken off at the elbow, rested on a little column, which had no pretensions to style or finish, and which was likewise broken. In the right hand was held a small figure of Nike, looking away from the statue. The Nike has the drapery thrown over the left arm. The right arm is half outstretched, and the right hand holds a small object, the meaning or nature of which is as yet unexplained. This portion of the statue was broken into a number of pieces, which, however, have all been recovered, except the head of the Nike. The Municipality of Athens have offered a reward of 500 francs for its recovery. The folds of the upper garment are well executed; those of the lower are stiff. On the pedestal, which is square, there are no bas-reliefs.

ATTEMPTED INTERFERENCE WITH THE ROAD AND RIVER TRAFFIC OF LONDON.

PUBLIC safety, public convenience, and public economy are held to be the main principles that should dominate the public communications of this country. We make no attempt to decide as to the relative importance of the three requisites, unless it be to remark that, while the first is absolute, the other two are to some extent relative. That traffic should be self-supporting, or pay for the convenience of which it makes use, has long been considered a good rule. But it is far from being a rule without exceptions. Very often it may be worth while, especially in new and sparsely-peopled countries, to make communications at the public cost, with a view to fostering and developing traffic; and to offer the use of such communications on terms that are not in themselves remunerative,—the general public welfare being the end kept in view.

When it is found advisable to commit the charge of any kind of public communication to private enterprise, including under this term the formation of companies, it is the duty of the public authority to see that these three main objects are carried out. It cannot be said that this duty has been at all satisfactorily performed in the United Kingdom during the last half-century. The sanction of Parliament to private enterprise has usually been obtained on considerations quite apart from that of the greatest public good. But the principle, at least, is admitted, and the efforts of the Board of Trade and of the Admiralty have been long directed to protect the safety and convenience of the public, in cases where the question of economy is left to private decision.

One essential part of the duty of the public authority is to see that the contractors for one mode of public conveyance are not allowed to interfere with the convenience of any other mode. In this respect Parliament has been very far from acting as a national guardian. Fifty years ago the Turnpike Trusts and the Canal Companies appeared before Parliament on the occasions of the application for Railway Bills; and the heights and widths of bridges were usually specified with considerable care in order to avoid rejection of the Bill. The Standing Orders of both Houses also bore upon this question. But above all, it was the Admiralty that chiefly appeared as the protector of the public; and that at times, as in the case of the Menai and the Saltash bridges, with what may certainly be regarded as unnecessary severity.

We do not know on what ground the promoters of the second railway bridge for the London and Chatham Railway over the River Thames have come to the conclusion that they may interfere, at their own good pleasure, with the navigation of the stream, and that neither Admiralty, Thames Conservancy, nor any other authority is likely to oppose the unprecedented liberty which they propose to take.

The present railway bridge at Blackfriars has five openings, with a level soffit at the height of 30 ft. above Trinity high-water mark. But this space no longer gives that freedom for navigation which it was intended to secure. The highest Thames tidal range has attained 4 ft. 6 in. above Trinity high-water, and an annual increase in the height reached is in progress. This, of course, cannot affect the existing works on the river; but it has to be borne in mind in regarding any new works. Twenty-five feet 6 in. clearance is all that is obtained, at the highest tide, with the 30 ft. nominal headway.

But the proposed new bridge, running over the southern span at the height of 25 ft. above Trinity high-water mark, dips down as it crosses the river, and, on reaching the City side, allows only 21 ft. from the Trinity high-water mark to the under side of the soffit. That is, it allows only 16 ft. 6 in. clearance at exceptionally high tides. It ought to be enough to call attention to this fact to secure the rejection, or at least the material amendment, of the Bill.

Nor is the street traffic of London dealt with in a less cavalier way than the river traffic by this calm and absorbing self-consideration. The land scheduled appears to include about 60 ft. of the width of Queen Victoria-street, in the narrowest part of that important thoroughfare. The proposed station appears to absorb the whole of the present entrance into Upper Thames-street. The matter is complicated by the question of level. On the whole, the Company appears to have dealt, or rather have attempted to deal, with a part of London where land is to be valued by the superficial inch, with as much indifference as if they were laying down a railway junction to be effected in the midst of Salisbury Plain.

Nor is the foresight evinced as to the probable cost more admirable than the care displayed for the avoidance of damage to road and river communication. Four hundred thousand pounds is set down as the cost of the bridge, for the building of which seven years is allowed; for the purchase of the land, for the scattering of Parliamentary opposition, and for contingent costs. We cannot call the Bill merely a prodigious practical joke, for the cost will be no joke to the shareholders. But it seems to us that so improvident and injudicious a scheme deserves some more severe rebuke than the mere declaration that the preamble of the Bill is not proven.

EXTENSION OF UNIVERSITY COLLEGE, LONDON.

THE opening of the new north wing of University College was to have been celebrated at a dinner given in the Library of the College, on Wednesday evening last, the Earl of Kimberley, president, in the chair, but the state of the roads was such that it was found necessary at the last moment to postpone it for a time.

We published a geometrical view of the new wing in our last, and propose to give in our next plans of the portions of the building devoted to various departments, with the view of showing the mode of fitting up severally required in such cases. In the meanwhile we avail ourselves of a descriptive account by Professor Henry Morley, printed for private circulation, to give in advance some particulars of two of the Departments.

Within the fifteen years from 1863 to 1878 University College had more than doubled the number of its students. There was every reason to expect steady continuance of this increase in the usefulness of an institution designed to secure for students in London, with all possible completeness, the highest form of

university teaching. Fifteen years ago no part of either wing had been added to the central façade. Successive additions have since been made; and the section of the north wing now opened completes the building as first planned, except that the end of each wing is not finished with ornamental stonework, but left for the next and last addition, that will give it extended frontage bordering on Gower-street. There has been unforeseen development, not only of the college, but also of single subjects of study, which now require much space and many appliances for thorough teaching. The bounds set to the building in 1828 by the design of its architect are too narrow for present needs. It was resolved, therefore, in 1878, to begin, and to carry on as long as may be necessary, a sustained effort to secure the fit completion of the college buildings. The whole cost has been estimated, and will be a little over 100,000*l*. Of this the section of the north wing now opened will take 35,000*l*., towards which about 21,000*l*. have been already subscribed.

The new buildings provide improved and extended accommodation for the Slade School of Fine Art; and the Fine-Art School is thus enabled to give up some rooms which it formerly occupied.

The whole upper floor of the north wing has been specially prepared for the study of physiology. On the ground-floor and basement, chemistry is provided not only with space in the north wing itself, but also with a large annexed laboratory on the ground behind. Rooms set free in the centre of the building by these new arrangements have been so dealt with as to secure proper accommodation for the School of Engineering, and a laboratory for practical botany.

The Slade School of Fine Art.

In the central portion of the newly-finished wing, the ground-floor, the first story, and part of the basement have been appropriated to the Slade School of Fine Art.

This school owes its origin to a bequest of the late Mr. Felix Slade for the founding of a Fine Arts Department in University College. Somewhat similar bequests, though to a smaller extent, were made by him to the Universities of Oxford and Cambridge, by which Mr. Ruskin and Sir Digby Wyatt (since succeeded by Mr. Richmond and Mr. Sidney Colvin) were severally appointed as professors, their duties being to give series of lectures to the students. By the council of this College, however, it was considered that the terms of the bequest as relating to it could be thoroughly complied with only by founding a school in which the fine arts should be taught practically. For this purpose the first part of the north wing was erected, containing studios for drawing, painting, and modelling from the life and from casts of antiques, with arrangements for the accommodation of female as well as male students.

A certain sum out of the bequest having been devoted to the endowment of a professorship for this school, the council elected Mr. E. J. Poynter, R.A., as the first professor, and the new building was opened for working purposes on the 9th of October, 1871.

A large number of students, male and female, soon joined the school; and the yearly report at the end of the first session showed an attendance of 122 students at the morning and evening schools, giving evidence, in the words of the report, that the school had supplied a real want.

After directing the Slade School with great success for five years, Professor Poynter, in the session 1875-1876, accepted the office of Superintendent of the Art Department and Government Art School at South Kensington, and tendered his resignation of the Slade Professorship, and the council elected Mr. Alphonse Legros as his successor.

Under Professor Legros the school has been no less successful in its career than in his predecessor's time; and want of space made it necessary to refuse many applicants for admission. In the new quarters assigned to it this deficiency has been in some measure supplied; and there is now sufficient easy accommodation for 140 students.

The entrance, which is situated in the hemicycle or semicircular projecting part of the north wing, leads at once into a spacious corridor extending to the right and left, the staircase leading to the upper story facing the entrance. At one end is a staircase leading to the ladies' refreshment and cloak rooms and lavatory, and, farther on, to those of the male students and also to a large life-studio, forming part of the old building, and now generally reserved for the male class.

On the ground-floor, to the right of the principal entrance, is the library and lecture-room, 40 ft. 9 in. long by 35 ft. wide and 16 ft. high, entered from the corridor. In this room are delivered the lectures on anatomy, perspective, &c., during the time appropriated to them. At other times the room is used for drawing from the antique and copying photographs from drawings by the old masters. The library contains a very valuable collection of old prints and drawings, presented to the school by the late Mrs. Grote, the widow of the former president of the College, also a number of the best modern works on art, purchased out of a fund subscribed in memory of the late Mr. Edwin Wilkins Field, whose interest in all matters connected with art is well known.

A room about the size of the lecture-room, on the same floor, is to be allotted to the sculpture class, should there be any demand for one, and in the meantime is used for drawing and painting from the antique.

The staircase already mentioned, facing the entrance, after a few steps in front, branches off to the right and left, leading to the upper corridor, which corresponds to that on the ground-floor. The hemicycle here fronting the quadrangle of the College and the whole length of the corridor, with the pillars supporting the upper floor and the arches at the farther end, are, when seen from a point of view on the right-hand side, very effective. From this corridor is entered the life-room of the ladies' or mixed class, which is a large well-lighted room, 40 ft. 4 in. by 35 ft., and 19 ft. in height, facing the north. Here also are the professor's studio and the antique-room, where are many casts of the best antiques, one of Michelangelo's slave in the Louvre, a rare cast of a torso of Venus from a statue found in the gardens of Sallust in Rome, and one of the Hermes lately discovered at Olympia. These two very fine casts were presented to the school by Mr. F. Marcet, and another of great beauty (a torso of Menelaus) was presented by his son-in-law, M. Duval, of Geneva.

Professor Legros has established a class for etching, with all necessary appliances for carrying on the process, in an unoccupied part of the new wing, communicating with the upper corridor.

Department of Zoology and Comparative Anatomy.

This department has received additional space through the erection of the new wing, though only one room (the professor's private laboratory) actually forms part of the new building.

The department now consists of (1) lecture-theatre, (2) north museum, (3) south museum and aquarium-room, (4) professor's private laboratory, all on the first floor, occupying the north-east angle of the college building, and of rooms on the second floor contiguous to the lecture-theatre to which some of them form a gallery. The rooms on the second floor are (5) the large practical class-room, (6) the attendant's gallery, with access to roof, (7) the north-west laboratory, (8) the north-east laboratory, (9) the assistant's laboratory and store-room.

The lecture-theatre is of considerable dimensions (floor-area of 30 ft. 6 in. by 20 ft. 9 in.), having been used until now both as museum and lecture-room. It penetrates the second floor, and is lit by a central skylight. At present it is fitted with seats for eighty students, but can easily be arranged for twice that number. Two side-walls of the lecture-theatre are provided with large curtain-screens for the display of diagrams (the collection of which, mostly new, numbers over 500), whilst a special arrangement of sliding-boards gives the lecturer no less than 120 square feet of black-board on which to draw in coloured chalks in the presence of the class. Special gas-burners are arranged so as to illuminate the black-board and diagram-screens in case of fogs, which would otherwise render graphic teaching impossible. The lecture-table is of large size (15 ft. by 3 ft.), in order to afford space for displaying specimens from the museum illustrating the lecture.

The north museum (with a square area of 49 ft. 10 in. by 41 ft. 9 in.) immediately adjoins the lecture-theatre, opening into it by a door in the north-east corner of the former room. A portion of the zoological collections are still arranged in the peripheral spaces of the lecture-theatre; but the crowding and concealment of specimens, which has hitherto been unavoidable, will be entirely avoided when the larger osteological specimens are removed to the new north museum. This room, as well as the south museum, has been fitted with carefully-constructed dust-tight show-cases, 10 ft. high and 2 ft. 9 in. deep where placed against a wall, or 3 ft. 6 in. where standing out in the centre of the room. The collection has been brought together by gifts from the late and present professors of zoology, and by the expenditure of a grant of 400*l*. from the council of the college. It has been specially selected and arranged with a view to teaching the more important facts of morphology, and contains some exceptionally rare and instructive forms.

The south museum and aquarium-room (floor-area 43 ft. 3 in. by 44 ft. 3 in.) adjoins the north museum, and is entered by a door in the south-west corner of the latter. It is lighted by three large windows facing south, and on this account has been selected as the position for a Wardian case, a fresh-water aquarium, and a marine aquarium. The walls are fitted with glass cases for the reception of a portion of the collections. The marine aquarium consists of an upper and lower tank, half the water being daily raised from the lower tank to the upper by means of a vulcanite pump, when it is allowed to flow back again into the lower tank, so as to insure its oxygenation. By means of this aquarium it will be possible to keep many marine forms for study and also for exhibition in illustration of lectures. The fresh-water aquarium is provided with a constant stream, and is specially intended for the hatching of fish and the study of the diseases of our river fishes.

The large practical class-room has an area of 50 ft. 3 in. by 23 ft. It is lighted from above by numerous skylights, which give ample light in fair weather. Twenty-five tables, each 5 ft. 6 in. by 1 ft. 8 in., and 2 ft. 7 in. high, are placed in two rows along the room. Each table seats two students, and is fitted with a drawer for the use of each student and an argand table-lamp. Glass cupboards to hold the microscopes provided for the use of the class, and other apparatus, occupy one wall of the room. A series of taps and two large sinks are fitted in a continuous table-bench along the opposite wall. Fifty students can dissect simultaneously in this room.

The attendant's gallery (floor-area 49 ft. 9 in. by 23 ft.) is immediately adjacent to the large class-room, being actually the south gallery of the lecture-theatre. Formerly the four sides of the gallery surrounding the lecture-theatre, on the second-floor, had no windows, and were used only as receptacles for lumber. They have, within the last five years, been converted into useful rooms by the cutting of a long skylight for the south gallery, and of two large windows for the north gallery. The north gallery is shut off from the lecture-theatre by a wooden partition, and divided into two rooms; the south gallery is still open. It is fitted with glass-door cupboards for containing chemicals and glass, with several tables, and a large sink with two taps. From the east end of this gallery a small iron ladder leads through a trap-door to an enclosed area of the flat-roof of the lecture-theatre. Two large slate tanks with continuous water-supply and waste-pipes are placed here for keeping frogs, fresh-water mussels, crayfish, and other animals used by the students of the practical class. This open area (the only one belonging to the department) is naturally of the greatest importance in several ways, viz., for exposing foul-smelling preparations to the air, for keeping animals, for growing certain plants, &c.

The north-west and north-east laboratories are the two rooms formed by enclosure of the north gallery of the lecture-room. They form excellent working-rooms for advanced students or assistants of the professor who may be carrying out original investigations under his direction. They have areas of 49 ft. 8 in. by 10 ft. 4 in., and are lighted by an almost continuous window facing north, and running, therefore, the length of the room. Each is fitted with long window-tables, glass-door cupboards, sinks with double taps, and table gas-lamps. Two, or if necessary three, workers can be comfortably accommodated in either of these laboratories. Each worker has for his use a table-space of 7 ft. by 2 ft., and a separate glass-door cupboard with key. In one of these laboratories a large incubator with internal chamber of 3 ft. by 1½ ft. is fixed, and is permanently maintained by a gas-burner at a temperature of 100° Fahr. It is fitted with

three doors, and is of such a size that microscopes can be readily introduced, so that a preparation may be incubated on the stage of the microscope without disturbing the selected point of observation. Each of these laboratories, as well as the professor's laboratory, the assistant's laboratory, and the large class-room, is provided with a complete set of histological reagents in glass-stopped bottles, and also with test-tubes, watch-glasses, Bunsen burners. The stores of these chemicals and glass apparatus are kept in the attendant's gallery, whose business it is to keep the laboratories properly supplied.

The assistant's laboratory and store-room is a large room (27 ft. 3 in. by 19 ft. 9 in) adjacent to the north gallery. A small portion is boarded off, so as to form a private work-room, whilst the outer space is used for keeping the stores of animals in spirit used by the practical class, and for lecture-demonstration. In this outer space cases arriving for the museum are unpacked, and all such rough work is performed as would be injurious to the laboratories or museums on account of the stirring up of dust and dirt. A slate tank with air-tight lid is placed in this store-room for receiving specimens preserved in spirit, which are too large for ordinary bottles or jars.

SANITARY SCIENCE AND CIVIL ARCHITECTURE.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE discussion on the paper read by Mr. E. C. Robins, Nov. 29, 1880, entitled "Sanitary Science in its Relation to Civil Architecture" * was resumed on Monday evening last. Mr. John Whichcord, President of the Institute, occupied the chair, and suggested at the outset that it would be more convenient if those portions of the paper having reference to appliances for drainage, &c., were discussed first, leaving the questions of warming and ventilation to be dealt with in the latter part of the discussion.

Professor Hayter Lewis, in a written communication (read by the secretary), expressed regret that his somewhat sudden departure from England prevented his being present to fulfil the duty which had devolved upon him as the mover of the adjournment of the debate. He ventured to treat the subject in a somewhat different manner to that adopted by previous speakers, and would assume a given town which, in regard of sanitary requirements as hitherto laid down (and in which he entirely agreed) was perfect, viz.:—(1) That soil and other offensive pipes were ventilated; (2) that the admission of foul air from the sewers into the house-drains was prevented; (3) that the sewers themselves had their foul gases carried off by ventilating openings; (4) that the storm-waters were carried off by separate drainage; (5) that the smoke nuisance was altogether abated; and (6) that the foul contents of the sewers were returned to the land in place of being hurried away from it to poison the rivers. With such conditions, taking London as an example, we should have the following results:—There were, he believed, about 550,000 houses in London, and allowing a due proportion of soil-pipes to drains and sewers, he thought they might fairly reckon upon having from a million-and-a-half to two millions of ventilating-pipes and openings discharging their deleterious effluvia into the air. He would say nothing as to the æsthetic appearance of soil-pipe ventilators and such-like appliances, which must be prominent objects, although one would scarcely suggest that they should be treated artistically in such a way as to show their object. At all events, they must necessarily have an aspect not much more agreeable than those multitudes of chimney-pots the appearance of which was so eloquently dwelt upon by Dr. Alfred Carpenter at the Society of Arts the other evening. He (Prof. Lewis) cordially agreed as to the necessity of the ventilation of soil-pipes, but he wished in all sincerity to endeavour to realise what their perfect ventilation would mean under all the conditions which he had enumerated as being insisted upon by sanitarians. By the exclusion of the storm-waters from the sewers, the contents of the latter would lose much of the oxygenating power of the waters, and if the smoke nuisance were cured the air would be deprived of the carbonaceous and sulphurous matters which some authorities asserted to be a partial protection against other and perhaps more deleterious matters. He was aware that the pure atmosphere would rapidly oxygenate and purify emanations from sewers, &c., but it would, he thought, be scarcely denied that, under some conditions of atmosphere, the pouring into it of foul gases containing, perhaps, the germs of disease, from a million and a half of foul pipes, would make it insupportable, or, at any rate, highly injurious, for any one to breathe. That being the case, it seemed to him that they ought to put before their engineering fellow-workers the necessity of destroying the foul gases which infested the sewers and polluted the air of our houses and towns. The method which General Scott had brought into notice appeared to be in some respects an approach in the right direction.

Mr. Gilbert R. Redgrave, by leave of the meeting, read a short paper prepared by General Scott (who was unable to attend) on the cleansing of foul sewers. In it the writer urged that whether what was called the "separate" system was adopted,—and it was the only one which could be advocated on sanitary grounds,—or whether we were content to put up with the ordinary deep and wide sewers rendered necessary to carry off the storm water and subsoil water, there must in either case be the risk of the generation of sewer-gas. Even by the adoption of Mr. Shone's ingenious system, — perhaps the most perfect form of the "separate" system, — it was impossible to obviate entirely the generation of foul gas. It might be taken that under the water-carriage system, however it might be practised, it was impossible to obtain entire immunity from deleterious gases and sewer emanations. He therefore proposed to deodorise the sewage, and at the same time to cleanse the sewers, by introducing into them, at certain points as they traversed the town, such chemical re-agents as lime, instead of using them as precipitants for the sewage at or near the outfall. This plan had been tried for several months at Ealing, during the hottest months of the year, and with very good effects.

Mr. Rogers Field said he must congratulate the Institute on the very admirable and elaborate paper read by Mr. Robins, which, if he were inclined to criticise, he should say was too elaborate,—dealing with too much for a single paper. The remarks of Professor Lewis went to the root of the whole question of true sanitation. The problem he put was this: that if we had all our sewers and house-drains thoroughly ventilated, we should have a million-and-a-half of ventilating-pipes in London emitting foul emanations and poisoning the air. As he had truly hinted, that was not and could not be the be-all and end-all of sanitary science; some means must be found for preventing the existence of the foul gases themselves. He entirely agreed with Professor Lewis, and a little consideration of the subject would show that it was not only possible, but quite easy to prevent such foul emanations. What did they come from? From the decomposition of organic matter. Wherever organic matter was allowed to rest, so as to decompose, there would foul gases be formed. All, then, that had to be done to prevent the formation of such gases was to prevent any accumulation of organic matter by arranging the sewers and drains so that such matter was immediately carried away. This requirement was so extremely simple that there was great danger that its simplicity would cause it to be overlooked. Into the question of the public sewers he would not enter (as it was one more exclusively belonging to the engineer than to the architect) further than to say that if the sewers were properly constructed, and (if necessary) properly flushed,—and, of course, ventilated,—there would be practically no smell in them. Where sewers smelt badly they did not answer their purpose in carrying off all foul matters quickly, but retained them until decomposition set in. Passing to the question of house-drains, he would say that it was a great mistake to imagine that the foul emanations which unfortunately did exist (and which were known as sewer-air or sewer-gas) came exclusively from the sewers. They came quite as much from defective house-drains. In all well-designed houses the house-drains should be completely cut off from the air of the sewers, so that, however foul the sewer might be, if the house drain was so made as to keep sweet, the evil of bad smells would be got over. Such a method of disconnexion as that which he advocated was not only perfectly practicable, but perfectly efficacious. Above all things, it was necessary to make the house-drains self-cleansing, and in order to be so it was necessary that they should be of proper size, truly-formed, and truly-laid. It was a great mistake to make them too large, because large drains and traps retained foul matter when small ones would not. In a house at the West End, where he was called to see to the drains, he found a 9-in. pipe laid, with a 9-in. syphon-trap. The trap was choke full of foul matter, and he at once saw that it and the pipe were too large. Prior to substituting a smaller pipe and trap,—for the house could not be then handed over to the workmen,—he, as a tentative measure, had the trap cleared out, but he found, a month afterwards, when the workmen got possession of the place, that the trap was nearly as choked up as before. For the 9-in. pipe and trap he substituted 4-in. ones, and there had since been no stoppage or foul smell. He did not mean to imply that 4-in. pipes were of the proper size to use in all cases. Then, again, it was necessary that the drain-pipes should have a sufficient fall,—at any rate, a better fall than that which seemed to be so favoured by some builders, and even architects, viz., 1¼ in. in 10 ft., which was not sufficient. The fall ought to be at least double that,—say one in thirty or one in forty, except where there are self-acting means of periodic flushing. Drains should not be laid, as they too commonly were, in curves, for then it was impossible to ensure their being truly laid. They should be laid in straight lines from point to point, as recommended by Mr. Rawlinson, with means of inspection wherever possible at points of junction or difference of level. If all these points were attended to, house-drains would be practically perfect, and incapable of retaining foul matter. Then, too, the water-closet apparatus must be self-cleansing. Whenever used, the flush should at once carry the whole of the contents of the pan through the trap and through the disconnecting-drain. There were some traps which always retained foul matter, such as those of the ᑐ-form, which were terrible offenders. Pan-closets should also be altogether forbidden, for they never could be thoroughly flushed out, but must retain foul matter. It was satisfactory to know that the importance of these points was now being generally recognised, and that in the regulations in the "Model By-Laws" lately issued by the Local Government Board, pan-closets and ᑐ-traps were forbidden to be used. Those regulations would soon, it was to be hoped, become the law of the land, except, perhaps, with regard to London, which, unfortunately, was not under the Public Health Act. In America great attention was being paid to such matters, and at Memphis, recently drained and sewered, the plumbers laid in stocks of pan-closets and ᑐ-traps, only to find them left on their hands. No closet that had not a proper flush and that did not carry away all foul matter ought to be allowed to be used. There was, it was true, some difficulty in knowing what to choose, owing to there being such a mass of apparatus of all kinds in the market. In that connexion, he thought the exhibitions of appliances promoted by the Sanitary Institute were likely to prove of great service, because their medals or prizes were never awarded to any apparatus without actual and crucial test. Wherever the closets and pipes in a house were what they should be, and carried off all foul matters at once, there would be no noxious emanations. That, he believed, was the solution of the question. He could not agree with Mr. Robins when he said that the principles now insisted upon by sanitary engineers were carried out by architects many years ago. The open-air disconnexion between the house-drain and the sewer was a new point of departure, and when he (Mr. Rogers Field) first commenced the practice five or six years ago, there were all sorts of practical objections raised against it, on the ground that it would prove to be a nuisance; but it had, he ventured to say, been conclusively established that when the work was properly done no nuisance resulted. It was urged against it, among other things, that it would be put out of gear by frost; but in a letter which he addressed to the *Builder* in 1879 (p. 239) he had shown that, during an exceptionally severe winter, in not one instance out of forty-seven houses where the ventilating disconnexion had been carried out under his direction, had any inconvenience resulted from frost. Testimony to the same effect had been given by Mr. Norman Shaw, by Mr. Eassie, and by Mr. Buchan, the inventor of a capital disconnecting trap, who

* See *Builder*, vol. xxxix., p. 666.

stated that, out of several thousands sold, he had never heard of one having been frozen.

Mr. Ewan Christian said it was all very well to insist on a "proper" flush for water-closets; but how was it to be got with the so-called "water-waste preventers"—they were rather "water-waste promoters"—insisted upon by those monopolists of water-companies? With regard to the point touched upon in General Scott's communication, it would be interesting to know what proportion of lime should be used to each thirty gallons of water.

Mr. Wallace Peggs, C.E., said that, with regard to the historical aspect of the question, he believed it could not be contested that the great point in modern house sanitation,—viz., open-air disconnexion of the house-drain and the sewer,—was new. Of course, disconnexion of sinks and bath-wastes was practised many years ago, but the disconnexion of soil-pipes and house-drains had been only recently adopted, and had quite lately been objected to by some medical officers of health. The ventilating disconnexion of the house-drain from the sewer was first practically carried out, he believed, by Mr. Rogers Field, although it was true that, about the same period, there were introduced disconnecting-traps, such as Pott's air chamber-trap, and Banner's fresh-air inlet combined with a trap; but to Mr. Rogers Field was due that beautiful arrangement, the disconnecting manhole, which was of the utmost value in house-drainage, as affording immediate facilities for inspection and cleansing, should anything go wrong. Professor James Thomson very early (about 1866) disconnected the soil-pipe of his own house, and delivered it into a street gully. (?) A very interesting piece of disconnexion, architecturally treated, had been met with by him lately. It was that of a sink in a Tudor mansion, and must have dated from the sixteenth century. He agreed generally with the evidence given by Messrs. Rogers Field, Eassie, and Griffith before the Society of Arts Committee, but instead of the wording of the first clause, he would prefer Mr. Rawlinson's stipulation, viz., "That the house-drain should not pass direct from the sewer to the inside of the house, but that the house-drain should end at the outside wall." He had seen Mr. Norman Shaw's open soil-pipe system in operation on the Bedford Park estate, and there it appeared to be a success, though not, in his opinion, quite properly applied, for the hoppers were directly under the windows. With reference to the cowl experiments at Kew, he had a commission from the committee to state that the experiments had been going on continuously, although a great deal of time had been necessarily consumed in testing the instruments, such as anemometers, &c., required for use.

Mr. Robert Rawlinson, C.B., said he thought he could claim some credit for many of the things which were now being spoken of as being essentials of modern sanitation,—such, for instance, as drains of small bore laid in straight lines, with inspecting manholes and ventilators wherever there were changes of level or direction. It had been said by one of our wisest men that to know our mistakes was perhaps the readiest way to correct them in future. He would mention a few mistakes in drainage that had come under his own observation. It had been customary, and was no doubt still customary, to lay the drains entirely through the houses, and serious evils resulted from the practice. Another serious mistake that was made was in neglecting to ventilate sewers and house-drains. Of course, it was not always easy to obviate those mistakes where they had been committed, but he submitted, that by proper attention the architect who might have to design, *de novo*, buildings as large as those in which it was now his misfortune to be located at Whitehall, could easily arrange the sanitary details so as not to necessitate the carriage of a single drain-pipe under the building. Then there was another rule which both engineer and architect should bear in mind from the beginning, viz., that no portion of the sanitary details should be so arranged as to be beyond immediate reach, or so as to necessitate the pulling to pieces of the building in order to get at them. In short, the sanitary appliances should be accessible at once without disturbing a single brick. That was not only quite possible, but it was quite easy. By the introduction of manholes upon sewers and house-drains, and by having the latter laid at right angles and at true gradients, they could be examined with ease, and it could readily be seen what they were doing, so that by having a correct record of all the branches and junctions, it was possible to remain for ever master of the situation. With regard to the ventilation of sewers and drain-pipes, some remarks that had been made in the course of the discussion only served to show how dangerous a little knowledge was. London had been held up as an example, but let it be taken as such all round. It was an example, and a marvellous example. It was by no means perfect in its sewerage; indeed, it had hundreds of miles of sewers just as bad as they could be, and unfortunately for London, the flattest part of it,—*i.e.*, Belgravia,—was in the worst condition, the sewers there having upright sides and flat bottoms, and were, in fact, sewers of deposit. The main sewer that drained Marlborough House, the sewermen told him, was the foulest in London; and the time might come, unless it was found possible to establish a self-acting periodic system of flushing, when the sewerage system of some parts of London would prove a curse instead of a blessing. Where sewers were properly flushed and ventilated, the air in them need not be bad; indeed, he remembered that during the meeting of the British Association at Manchester, a paper was read in the Chemical Section in which the author asserted that by actual experiment he had ascertained that the air in the main sewer was purer than that of the room in which the meeting was being held. Open-air street ventilation of sewers, as practised in London, was an annoyance, perhaps, to people who did not understand the matter. They said that the openings stank. Well, no doubt they did stink sometimes, though they ought not to do so. But get rid of all the openings from the sewers, and what would become of London? Admitting that they did sometimes stink, it should be remembered that in so doing they did a minimum of evil. A great deal of the evils connected with town drainage had arisen from the fact that at one time,—not so very long ago,—it was forbidden by stringent enactment to connect any water-closet with the main sewer. That led to the creation of cesspools, one or more of which would be found beneath or close to every house that was a century or even half a century old. The dry earth or pail system, as carried out at Rochdale, had certain advantages, but it was very costly, the loss being about 10,000*l.* or 12,000*l.* a year in that town, even though the municipality got 3*l.* or 4*l.* per ton for the contents of the pails. A great deal had been said about the extravagance and wastefulness of throwing sewage into the sea, and it had been contended that it should be turned upon the land, but the political economy that would spend 30*s.* to save 20*s.* was not likely to gain much in favour. Wherever it could be done, however, there was no doubt that the land was the right place for the sewage, and if sewage irrigation could not be carried on at a profit, the deficit should be paid by the town as a necessary part of the outlay for scavenging. In conclusion, Mr. Rawlinson alluded to successful sanitation as carried out in America, and at Lord Spencer's house.

Professor Kerr said the information which they (the architects) had received from engineers had been most interesting; at the same time, a word might very well be said from the architect's point of view of the question. It was very plain that the engineers had provided them (the architects) in towns, outside their houses, with a most pestiferous system of sewers. That was not the fault of the architects, and he hoped that for the future that would be clearly understood, and so far as regarded whatever curative methods might be required outside the houses, he hoped the engineers would adopt them. Architects, however, might fairly be expected to understand the matter so far as it came within the walls of the buildings they erected. He had had something to do with houses, and he had no hesitation in saying that there was no real necessity for introducing within the walls of our houses the prodigiously complicated appliances which were put forward on every hand, and which to him presented no other idea than that of an interminable vista of increasing difficulty and increasing failure. The course which he thought would be the best to adopt would be to banish all water-closets and pipes from the house, and put them together in an annexe at the back. Only a few years ago there was no such thing as a water-closet inside a house. It was those ingenious gentlemen the engineers and plumbers who had produced all the complication and danger that had ensued by introducing their appliances inside the house. The present system of "scientific plumbing," as it had been called, was increasing in complexity to an astonishing degree, and when one heard of the multitude of closets and other appliances that competed for prizes, one was led to ask, Where will it end? As to prohibiting the carrying of drain-pipes underneath houses, architects had to deal with things as they found them, and when the offices of a house were at the back, as they usually were, and the sewer under the road in front, they had no option but to carry the drain under the house. The evil of doing so might be mitigated if, in connexion with the annexe of which he had spoken, a subway were made beneath every house for the passage of the drain and other pipes.

The discussion was continued by Mr. R. B. Grantham, C.E. (who spoke chiefly with regard to the construction and ventilation of main sewers), Dr. G. V. Poore (who urged that, to avoid the necessity of carrying drain-pipes under houses, the water-closet annexe should be placed in front,—which was seldom, owing to street noises, the best part of the house,—and treated æsthetically), by Mr. William White (who urged that doctors and engineers might, if thought desirable, be met with a *tu quoque* when they ungenerously and unfairly sought to throw all the blame of defective sanitation upon architects; and that it should be remembered by all that, much as had been done, sanitary science was by no means yet exalted to the position of an exact science, it being still in a state of transition), and by Colonel Jones, V.C.; and on the motion of Mr. Henry Dawson, it was adjourned until Monday, the 14th proximo.

DWELLING-HOUSES: VENTILATION, LIGHTING, AND WARMING.*

THE PARKES MUSEUM OF HYGIENE.

WITH reference to the lighting of rooms, of course the softest and most agreeable method of lighting is by wax candles; but the expense of this method precludes its general adoption except in the drawing-rooms and boudoirs of the rich. But there are many candle-lamps (with reflectors for reading, and without them for general lighting), which were in common use before the introduction of colza oil, paraffin, and other lamps. The inconvenience attending the preparing and cleaning of such lamps has, however, lessened their use, and the cheapness and ready application of gas has led to its most general adoption. The brilliancy of its light, too, when once it has been experienced adds so to the cheerfulness of the house that it has superseded in a great degree every other.

But, as Dr. Corfield observes in the little book I recommended to you in my first lecture, "candles, lamps, and gas, all help to render the air impure." It is calculated that two sperm candles, or one good oil lamp, render the air about as impure as one man's respiration does, whereas one gas-burner will consume as much oxygen and give out as much carbonic acid as five or six men or even more. This is why it is commonly considered that gas is more injurious than lamps or candles. And so it is, when the quantities of light are not compared; but with the same quantity of light, gas renders the air of a room less impure than either lamps or candles. If, in the dining-room, instead of using five or six gas-burners, as we too often do, without any provision for the escape of the products of combustion, we used forty or fifty sperm candles instead of six or eight, we should have a fairer comparison between gas and candles.† Common sense at once suggests that the products of combustion should be carried away, and the heat generated by the process should be utilised to expedite its removal, and several manufacturers have turned their attention to this desirable end.

Messrs. Strode's sunburner, used for lighting large assembly-rooms, is conceived on this principle. Thirty or forty or more gas-jets are placed close together under an enamelled iron reflector from which the heated air is conducted through the roof or floor to the exterior, the

* By Mr. Edward C. Robins, F.S.A. The second of a course of lectures at the Parkes Museum, to members of Building Societies, delivered on Jan. 8th, 1881. See p. 63, *ante*.

† There are many alleviations to the objections to lamps, and one of them is the "Libra lamp," Hopkinson's patent, to be seen here. The supply of paraffin oil is regulated by the patent valve, and is said to save much time in cleaning and filling, and will burn for seventy or eighty hours without trimming.

tube which is employed to withdraw the expired air of the apartment being enclosed in a second tube forming a jacket a few inches from it.

Messrs. Benham & Sons have provided a globe light for use in ordinary apartments which is very ingenious and effective. The globe is suspended from the ceiling, and is open at the top; the suspension-rod is a hollow tube into which the glass chimney surrounding the burner conveys the products of combustion, which are carried away through tubes to the exterior or into a chimney flue. A metal jacket surrounds this tube in the thickness of the floor, and the pendent ornamental rose forming the junction between the pendant and the ceiling is pierced to allow of the exit of the vitiated air of the apartment. But in addition to this, between the rose and the ceiling, is a small space through which fresh air is admitted to feed the light, thus at once adding to its brilliancy and replacing the air withdrawn by the extracting tubes. See specimen in the Museum.

A still simpler and less expensive arrangement is Messrs. Faraday & Sons' ventilating gas pendant, also exhibited here. The following is the description given in the catalogue:—"This pendant is designed to afford a strong concentrated light with means for carrying away the products of combustion. The gas supply-pipes are fixed outside the ventilating-shaft, which is thus kept clear of obstruction for the purpose of securing a good draught. Screens of opal glass, which can easily be removed for cleansing, are provided to soften the light. The trumpet-shaped glass terminating the ventilating-shaft is released by simply pinching the buttons of the spring clip together. The argand burner is fitted with a lever check to regulate the flame. Horizontal extract tubes connect the upper end of the ventilating tube with the exterior or flue."

General Franzini has presented to the Museum his patent globe reflector. This lamp consists of two hemispherical pieces of crystal. One of these is a bottle used to contain filtered water. The other is of opal, in which may be placed gas, oil, electric or any other light. The light placed between the two crystals is magnified by the water; with the globe is included a conductor to carry off heat, smoke, and smell from the burning light into the water. The same person has invented what he terms the "healthy" gas burner, and presented one to the Museum. It consists of two small burners fixed side by side to secure more perfect combustion, and an increased amount of light, from a given quantity of gas. The two flames blend together in one large flame, and give seven times the light with no greater expenditure of gas and less product from combustion.

The Silber Light Company have a similarly contrived burner, which I have introduced into my own office with great advantage. A special globe is made for it, and the result is a clear, bright, steady flame, like an argand.

With regard to gas-burners generally, they should be provided with some disc (in steatite or terra-cotta), or other means of checking the pressure, and the orifices should be large and also of some non-corrosive material.

The Bronner and the Bray are good flat-flame burners, and the Sugg and the American "regulator" as argands or "ring" flames. Any of these give a good light in proportion to the gas consumed, and are vast improvements upon the burners made of iron or brass, without pressure or check, and drilled with very small orifices, such as were commonly in use until the last three or four years.

The Bunsen, or air and gas burner, is still much used for heating purposes, as it has something of the energy of the blow-pipe, and makes no smoke. A small one of this class may be seen in Faraday's nursery or kettle bracket in the Museum, and it is now being adapted for gas-coke fires, something on the principle recently advocated by Dr. Siemens.

The electric light will soon be a household thing, and then we shall have no products of combustion to think about and no injury to our furniture and frames to deplore.

Gas stoves for cooking purposes are various and economical—from the simple ring of gas jets, mixed or unmixed with air, to the vast machinery in use at the London Hospital, where 400*l.* a year is saved by the use of Leoni's gas-cooking apparatus.

Gas-stoves for warming are highly convenient, if not at present economical, for continuous use, but for occasional employment they are most economical, and by the arrangement of pumice-stones, asbestos, terra-cotta lumps, or a combination of all three, very bright and sparkling furnace-looking fires with considerable radiating power are attainable.

Hall-stoves may be usefully contrived for burning gas, since they need no tending and take no space. But for ordinary room fires it will be long before we shall be able to dispense with wide and open coal fires. Nothing can compare with them in the opinion of the home-loving British public. Certainly nothing is more healthy, cheery, or wasteful. We cannot give it up for the close stoves of the Germans or the Americans, and so we may as well turn our minds to its improvement.

The natural process by which the temperature of the air is raised is either by radiation or conduction.

Conduction, or, rather, conducted heat, is the warmth given off by any surface by direct contact with any substance, whether air or otherwise.

Radiated heat is like that of the sun which passes through the air as light without heating it, into the earth or any intervening substance, from which the heat is given off gradually to the atmosphere, creating the difference between sun and shade temperature. Thus it is that the conducted heat of an open fire goes up the chimney, and about a sixth part is radiated into the room, passing through the air without sensibly heating it, but warming the first obstacle to its free passage, such as the enclosing walls and furniture, by which the radiated heat is given off to the air of the room, raising its temperature as required. It cannot be called an economical mode of heating, but it is the most enjoyable and most healthy. All the products of combustion pass up the chimney and draw after them the impurities and denser air of the room lying lowest, while the vivifying ray of the crackling fire, heat without scorching the surfaces that warm the air of the room insensibly.

The primary, but not the exclusive, object in the improvement of an open fire-stove must obviously be the increase of its radiating power by reflection from heated polished surfaces in close contact with the fire, and this is done by many of the best stoves. One of the best forms is where the fire-cheeks are of polished steel set at an angle of 45° with the back of the stove, and projecting in front of the fire-bars so as to receive the brightest radiation; the upper part of the front of the stove made to be set at a similar angle, to the same end, and the hearth of encaustic glazed tiles, or covered with a radiating steel fender. Such a stove has an immense power of radiation, and many old-fashioned stoves are so constructed.

The latest improvement with this design is the new register stove patented by Messrs. Comyn, Ching, & Co., called the "Paramount." In this case the fire-grate or basket is quite disconnected from the brickwork surrounding it, and equally so from the metal case, or shell or encaustic tile lining of the chimney back and sides, excepting only at the point of contact with the bracket which supports it, giving a free space all round. Thus the fire is enabled to radiate as from a centre; the rays of heat emitted from the back of the fire-basket, impinging on the metal reflector, or on the tiled lining of the fireplace, are reflected forward into the room and utilised, instead of lost, as heretofore. This back reflection-plate and centrally fixed rotatory movement of the fire-basket is novel, and calculated to economise fuel, promote cleanliness, ensure uniformity of combustion, double the radiating power, and, being movable, may be carried from one room to another.

The letters to the *Times* of "Another Country Parson" and the late Mr. Mechi, of Tiptree Hall, drew the public attention to a valuable series of economical slow combustion, yet large radiating fire-fronted stoves, made by Barnard & Bishop, of Norwich. These stoves heat by direct radiation, and have no reflecting surfaces; the bars are many,—six in number,—and of various widths to suit the size of the rooms to be heated. They are rightly called the "Front Fire Grate Stoves," and are fitted with blowers to encourage the draught at pleasure. The bottom of the grate is closed (which produces slow combustion), and within 4 in. of the hearth, to which it slightly inclines; the sides and back and bottom are of terra cotta. The sides are set at an angle of about 60° with the front, and the back is about 3 in. or 4 in. from behind the front bars, at the bottom, and 4 in. or 5 in. at the level of the top bar. By this means the fuel is all spread out next the front bars, which thus present, with the least consumption of fuel, a large surface of fire for radiating the heat into the room to be warmed. I think this depth too small, and prefer the larger sizes, and particularly those with bent lower bars, to prevent the fuel caking and requiring frequent stoking.

But in all these stoves the conducted heat goes up the chimney; and none of them are ventilating stoves, except as extract-flue heaters. But specimens of these may be seen in the Museum, such as the "Galton Stove," the fresh air passed through which is delivered into the room several feet above the mantel-piece.

Boyd's School-Board Hygiastic Ventilating Fire-grate is one which has been very considerably used by the London School Board, superseding many others, and found on the whole to realise in practice the principles of its construction very effectively, more especially the larger-sized stoves. The fresh air is introduced under the back hearth, which is made of iron, and the backs of the larger stoves are furnished with gills to increase the heating surface over which it must pass before it is delivered through the wide grating in front of the stove, the size of which is regulated for the admission of as much air as the size of the stove is predetermined to be sufficient to warm in its passage through it. It is also in proportion to the inlet of fresh air required to replace the vitiated air drawn off by the extract-shafts, which it is a part of Mr. Boyd's system to require wherever his stoves are used, for which he supplies gratings with or without gas-jets.

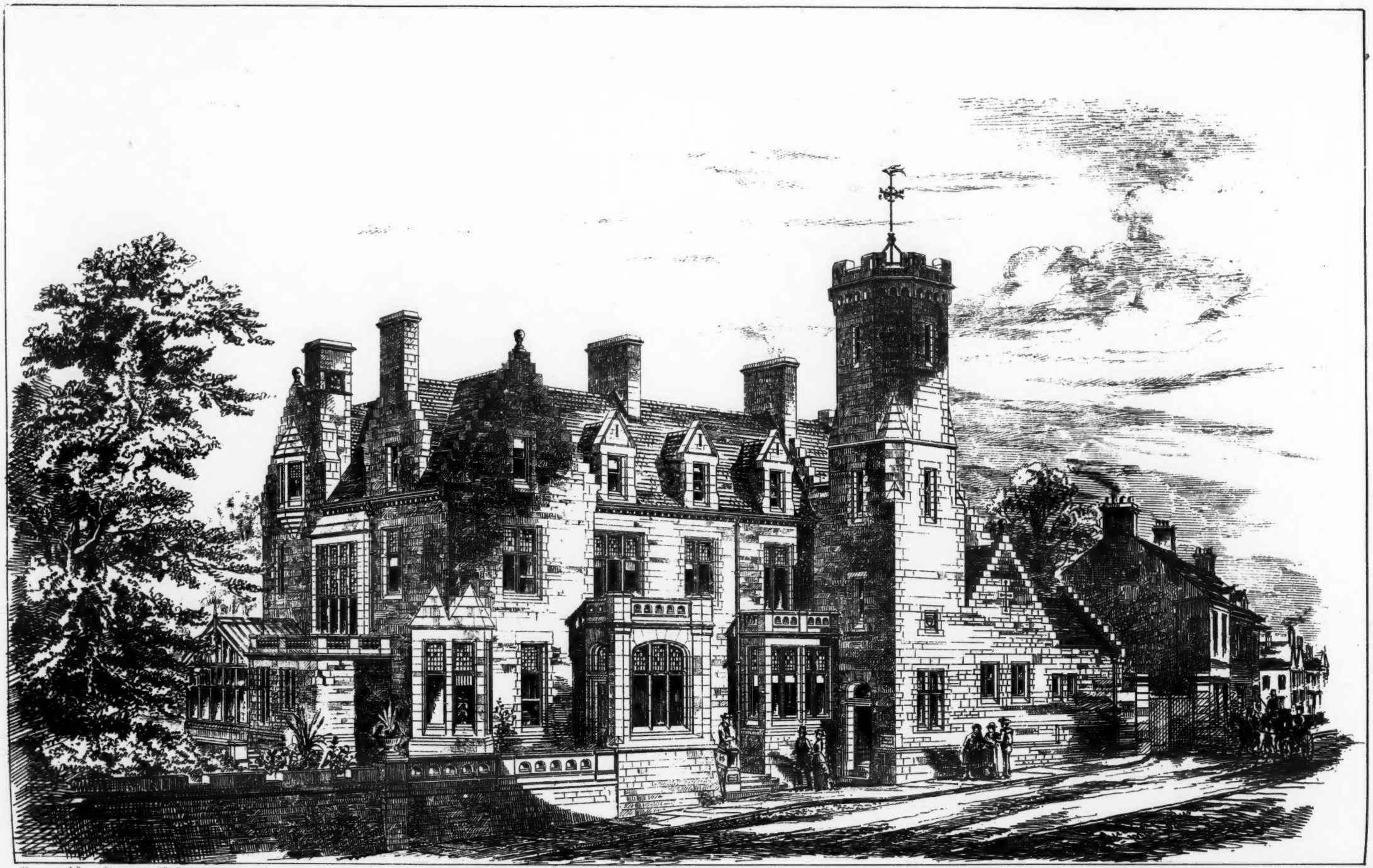
Mr. Boyd has just brought out a new open fire-stove, to be disengaged from the wall and enclosed in a case, through which the air passes vertically into the room, which is, as has been before remarked, the proper way to introduce fresh air, whether warm or cold. The fresh air is brought up in a wall-flue from below, and feeds the air space under the iron hearth, and at the sides and back of the stove. From the upper part of the stove the wall-flue is continued as a smoke-flue to the chimney-stack, the air-flue ceasing at the hearth. The basket fire-grate is removable for cleaning the flues. Obviously the warm air generated by conduction under and in the rear of the fire-basket may be carried up into a bedroom over, instead of into the room in which the fire may be, or into a hall if the fire-place should happen to be in a wall flanking the hall or staircase.

There is another stove to which I must refer, a specimen of which is in the Museum. It is patented by an architect, Mr. H. Saxon Snell, and is made by Messrs. Potter & Sons, and is called the Thermhydric Ventilating Hot-water Open Fire-grate, which may be seen in active use throughout the house of the inventor.

The open fire-grate is surrounded on three sides and on the top by a wrought-iron chamber containing water, which, when warmed by the fire, circulates through upright coils of pipes placed on either side. The hearth is made of iron, and the whole space below the grate and pipes is formed into a chamber for the admission and collection of air from the outside. The outer fresh air thus admitted passes upwards, and, impinging against the sides of the hot-water chamber and pipes, is warmed before entering the room. By connecting this stove, situated, say, on the ground-floor, with a coil of pipes in the room over, the same fire will heat both rooms or even more than two rooms, for the open fire-stove is, to all intents and purposes, a hot-water apparatus furnace.

These Thermhydric Ventilating-stoves heat the air of the room both by radiation from the open fire and by conduction by means of the heated surfaces over which the incoming fresh air passes in its passage through the warm-air chambers of the stove, so that the conducted heat in these cases is not all wasted, but in the passage of the smoke to the chimney-flue it is utilised to warm the fresh-air chambers referred to.

The last thing in economic warming is the Lambeth Radiating Tile Stove. "No cleaning required, no sweeping, no smell, no attention, no waste, no danger, no fixing, no dirt, no dust." Such are the terms in which Messrs. Doulton introduce to the New Year their new stove, which has been the result of much study and experiment; it is recommended for use in studios, surgeries, school-rooms, halls, conservatories, and waiting-rooms, and will burn for twelve hours with an expenditure of only five pounds of coal. I hope to see a specimen in this Museum soon. Those who have read Dr. Carpenter's lecture at the Society of Arts on "Fogs," or attended the



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PURBECK HOUSE, SWANAGE.——Mr. G. R. Crickmay, Architect.

Whiteman & Bass, *Photo-Litho* 236 High Holborn

"EVERTON," NEAR LYMINGTON, HANTS.—MR. G. R. CRICKMAY, ARCHITECT.

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Univer of MICHIGAN

meeting at the Mansion House yesterday, as I did, will be as anxious as I am to hear the result of the experiments about to be undertaken at Kensington to show how the greatest amount of heat may be obtained with the least consumption of fuel, and best provision for preserving the purity of the air at one and the same time.

I think I have now sufficiently ventilated my subject, and drawn attention to the various applications of different principles, both in warming and ventilating; it is not necessary to multiply examples.

I have said nothing about the various systems of heating by high and low pressure hot-water apparatus, or by hot air or by steam. When the electric light is laid on to our houses will be time enough to lay on steam for heating them too. The engines that will be required to maintain the electric current can be utilised to supply steam to warm the buildings so lighted.

What I have said I have felt applicable to ordinary dwelling-houses, such as those in which you are likely to be interested, but perhaps I may usefully inform you that I have treated of the sciences of warming and ventilating generally in my paper on "Sanitary Science in its Relation to Civil Architecture," read at the Royal Institute of British Architects on November the 29th of last year. This paper, with its additions and appendices, and the discussion thereon (which is not yet completed, and will be resumed on February 14th), will be printed in the Transactions at the end of the session, and may be purchased by any one at the price fixed by the Council.

In 1874, on the establishment of the *Sanitary Record*, I wrote a paper therein on the Sanitation of School Buildings, which I followed up by a paper at the Society of Arts last spring, on Secondary Schools generally, their design, construction, and sanitation, which may be purchased of the secretary.

In 1877, I read a paper on Ventilation at Milton Mount College, Gravesend, which was published in the *Architect* at the time. In this paper I treated of the subject generally, and particularly described the sanitary provisions made by me as the architect of the building.

In the summer of last year I gave some descriptive particulars on warming and ventilation to the members of the Architectural Association, who visited my latest secondary day-school for 500 girls, at Sandall-road, Camden-road, of which the veteran teacher, Miss Buss, is the principal, and these remarks, entitled "The Sanitation of Sandall-road Schools," were published in the journals, and separately printed for circulation.

These are not my only contributions to the elucidation of the subject in hand, but this notice of some of them may suffice to show the interest which is felt by the architectural profession. Mr. Godwin, the editor of the *Builder*, who has kindly published in full these lectures so far, Mr. Seddon, Mr. Blashill, Mr. Statham, Mr. Shaw, Mr. Collins, Mr. White, Professor Lewis, and other architects, have written and repeatedly spoken in favour of the proper sanitation of dwelling-houses; and I mention their names with honour, because I am not aware that they themselves have directly been benefited by their labours to interest others in the good work of making healthy the homes of the people.

Enterprising tradesmen, with more or less philanthropic ends, have aided the movement greatly, and Mr. Edwards, of Great Marlborough-street; Mr. Buchan, of Glasgow; and Mr. Hellyer, of London, have each written interesting and useful illustrated works on warming and ventilation, plumbing, and sanitation generally. The pamphlets of the Ladies' Health Society may be consulted with advantage.

This hasty sketch is intended rather to quicken than to satisfy your curiosity, to make interesting to you a valuable subject of study, and to afford you the key to other and more complete sources of information,—such as Captain Galton's new work, entitled "Healthy Dwellings," and Dr. Parkes's, to which I referred at the commencement of my address. Perhaps the medical profession have added most largely to the literature of the subject, as might be expected. And in thus bringing to a conclusion my contribution to the present course of lectures, you will allow me to thank you for your intelligent interest and patient attention, which I trust you will maintain to the end of the course.*

* The audience, which included a number of ladies, was even larger than at the first lecture. Mr. Robins was repeatedly applauded, and at the close a vote of thanks was accorded to him.

"EVERTON," NEAR LYMINGTON, HANTS.

THIS house, built for Col. Trevor-Goff, and which is approaching completion, is situated in a well-wooded and charming part of Hampshire, about three miles from Lymington. The site affords good views both of country and seawards, overlooking as it does the Solent, studded with sail and innumerable craft, and the Isle of Wight in the distance. The house is built in the homely, simple, and picturesque style so much used in England a century and a half ago, and is executed with red brick of a pleasing colour, and the upper part tile-hung with Broseley tiles, or half-timbered and filled in between the framing with stucco. The roofs are also covered with tiles, but of a darker shade. A cove is formed in stucco under the eaves, ornamented with strapwork patterns in *sgraffito* work. The small quantity of stonework is from Doulting, with the exception of the plinth, which is of Portland roach-stone, and very bold, forming a substantial base to the superstructure. The view we give is taken from the north-west angle, showing the entrance. On the south side of the building is a loggia on the ground-floor, from which leads the garden-entrance, and over the same, and running nearly the whole length, a wide verandah, from which the views the landscape affords may be enjoyed.

The interior work is in character with the exterior, having wooden dados in the hall and principal rooms, the ceilings panelled with moulded wooden beams; and a handsome staircase and screen specially designed throughout. In the library, pleasing reminiscence of the past, is an "ingle nook" fitted with panelling, pilasters, decorative panels in tapestry, &c., and with bookcases on either side, and every convenience. The joinery generally is executed in carefully-selected pitch-pine, some of the fittings being in American walnut.

At the rear of the main building, on the east side, is a good range of stable-buildings fitted with modern conveniences; and amidst the trees on the left of the entrance is a dairy building, fitted up with deep slate troughs on the German system. The roof is covered with reeds, and, with an ornamental finial, forms a picturesque feature. It is intended to build the conservatory shown on the plan, and also to add a good billiard-room.

The cost of the works already executed is about 7,500*l*. The work has been executed by Mr. A. H. Green, of Blandford; and the carving by Mr. Harry Hems. Mr. G. R. Crickmay is the architect.

PURBECK HOUSE, SWANAGE.

OUR view is taken from the High-street, Swanage, Dorset, the main street of the town steep and narrow, and lined with stone buildings, covered with stone tile roofs, characteristic of the stone country and the sturdy inhabitants. Purbeck House, built for Mr. George Burt, J.P., stands on a fine site and commands extensive views of the whole neighbourhood. The construction is massive and in accordance with its surroundings. The walls are built of various coloured granites in irregular rubble work, and the porch is entirely of white Cornish granite; the dressings and chimney-shafts are of Purbeck and Portland stone; the roofs are covered with Broseley tiles; and the effect obtained from the colours of the various materials is very agreeable.

The style of the building is Scottish Baronial in character, and the details throughout are bold rather than elaborate, and, in fact, bear traces of studied simplicity.

The hall is laid with mosaic pavement, similar in design to that found near the ancient Wallbrook, by Messrs. John Mowlem & Co. (the firm of which Mr. Burt is a member), when excavating for the new Queen Victoria-street. The passages on the ground-floor are laid with mosaics in patch-work. The hall and passages are heated with hot air, and gratings are provided in the skirtings for the same. Every room in the house has a separate flue for the outlet of foul air, and other sanitary appliances. Warming and ventilation throughout have been carefully studied. A chimney-corner, with space sufficient for two or three persons to sit at the sides, is provided at the end of the dining-room.

The work has been executed from the design and under the superintendence of Mr. George R. Crickmay, architect.

ST. JOHN'S CATHEDRAL, NEWFOUNDLAND.

NEWFOUNDLAND, our oldest colony, has made considerable advances of late years. It was discovered by John Cabot as long ago as 1497. The capital, St. John's, lies on the slope of a hill, and the natives, one is glad to hear, consider it the best place in the world. A recent writer says:—"Two-thirds of the passengers in the fine steamer *Caspian*, under the command of the experienced and vigilant Captain Trocks, in which I journeyed to Newfoundland, were natives or inhabitants of the island, and all of them were evidently convinced of the superiority of St. John's over any city in the world, of the salubrity of the Newfoundland climate, and of the perfection of the island as a whole. When it was suggested that many changes might be made for the better, that the interior of the island might be thoroughly explored, that its agricultural as well as mineral resources might be developed, and that a railway ought to be constructed, they scouted these notions as works of supererogation. Indeed, the majority of the islanders may be charged with a contentment which is akin to supineness. They are too well satisfied with their condition." It cannot be denied that many men have prospered exceedingly under the existing Government of Newfoundland, and that a large portion of the community has accumulated wealth. It is indisputable, however, that the body of the people can do little more than earn a livelihood. The progress which the richer class do not desire and seem to dread would benefit the whole community. Incredible though the statement may seem, it is nevertheless literally true that the interior of the island is less known than the heart of Africa.

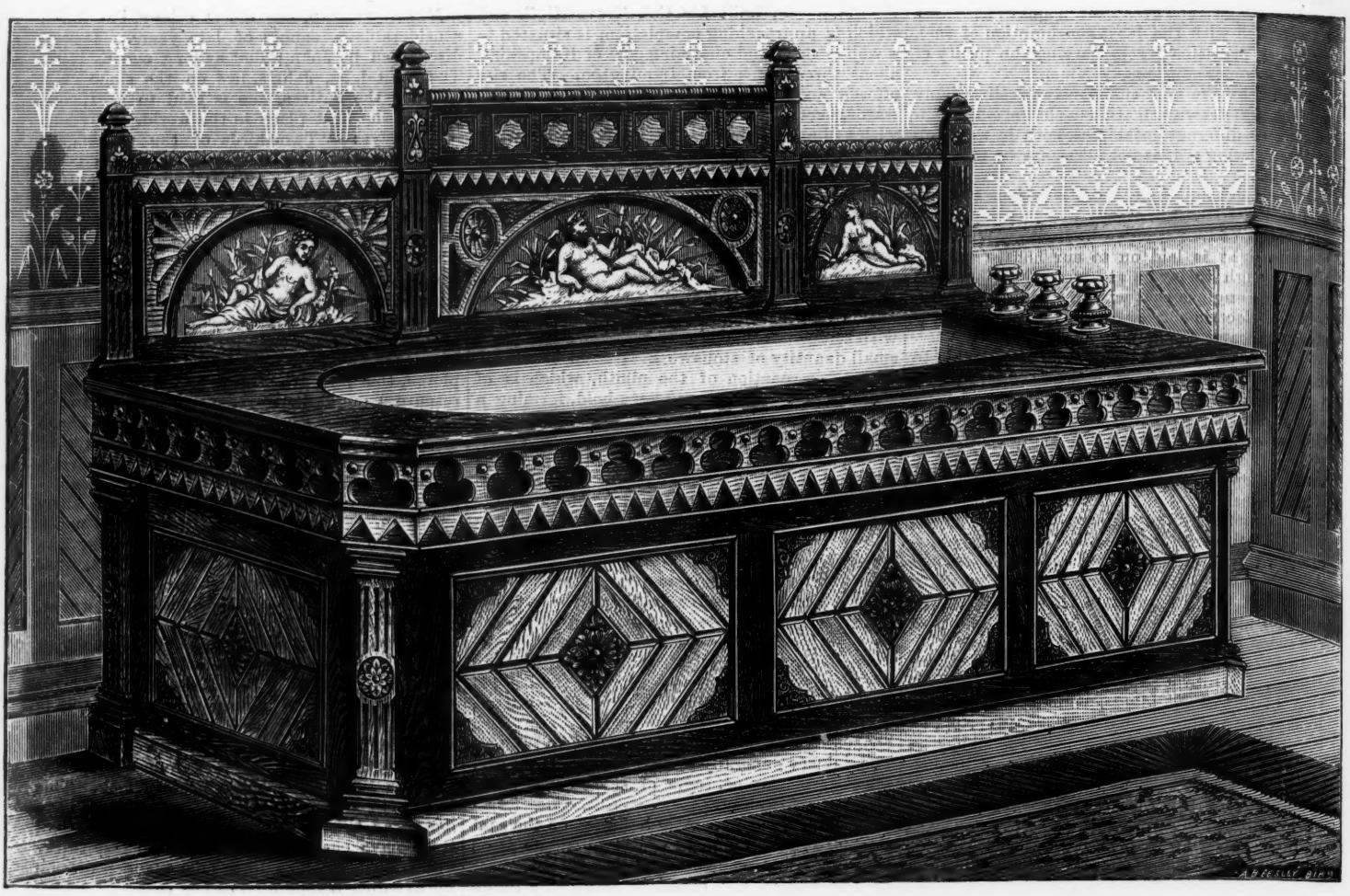
Although St. John's was founded as far back as 1527, yet it has a modern look. This is due to the fact that repeated fires have destroyed the buildings, and that nearly all of them have been erected within the last thirty years. The citizens have now made provision for avoiding a repetition of the calamity which has caused them so much loss and suffering. In the streets where an outbreak of fire might be most serious, the erection of wooden structures is absolutely prohibited. Moreover, a service of water, always available, has been provided for the extinction of fire in any part of the city. At the water's level there are wharfs running round the bay. Behind the wharfs on the north side is Water-street, which is filled with shops and merchants' warehouses. This street has the uninviting aspect of most streets similarly situated in seaport towns, the services of a scavenger being obviously required. The other streets are much better kept, and they contain many neat dwellings of wood and brick. "Were it not that Acts of Parliament are on record to testify to the fact, it would be difficult to believe that up to the year 1811 no person could build a house here without written permission from the Governor, and that such permission was invariably refused unless the building were exclusively adapted for the curing, salting, drying, and husbanding of fish. Indeed, the policy of the statesmen of the last century was to protect and cherish the Newfoundland fisheries."

The most conspicuous edifice in St. John's when approached from the sea is the Roman Catholic Cathedral. It is built of stone, is in the form of a Latin cross, and has two towers, each being 138 ft. in height. Close at hand the Church of England cathedral, from the design of the late Sir Gilbert Scott, is in process of erection. The nave has been finished for several years, and is used for divine service. When the necessary funds are raised, and the cathedral is complete in all its parts, the pile will be one of the grandest on that side of the Atlantic. We give a view and plan of the building. The work is being carried out under the direction of Mr. Gilbert Scott, Mr. J. Wills being the clerk of works.

The walls are being built of local rubble, the dressings being of Giffnook stone, from Scotland.

Halle Exhibition.—In the spring of the present year, an Exhibition of Art and Industry will be opened at Halle on the Saale, in Prussian Saxony. The Exhibition Building is already finished; the height of the cupola is 40 mètres. The edifice altogether presents an imposing spectacle.

ENGLISH ART WOOD-WORK AT THE MELBOURNE EXHIBITION.



ENGLISH ART WOODWORK AT THE MELBOURNE EXHIBITION.

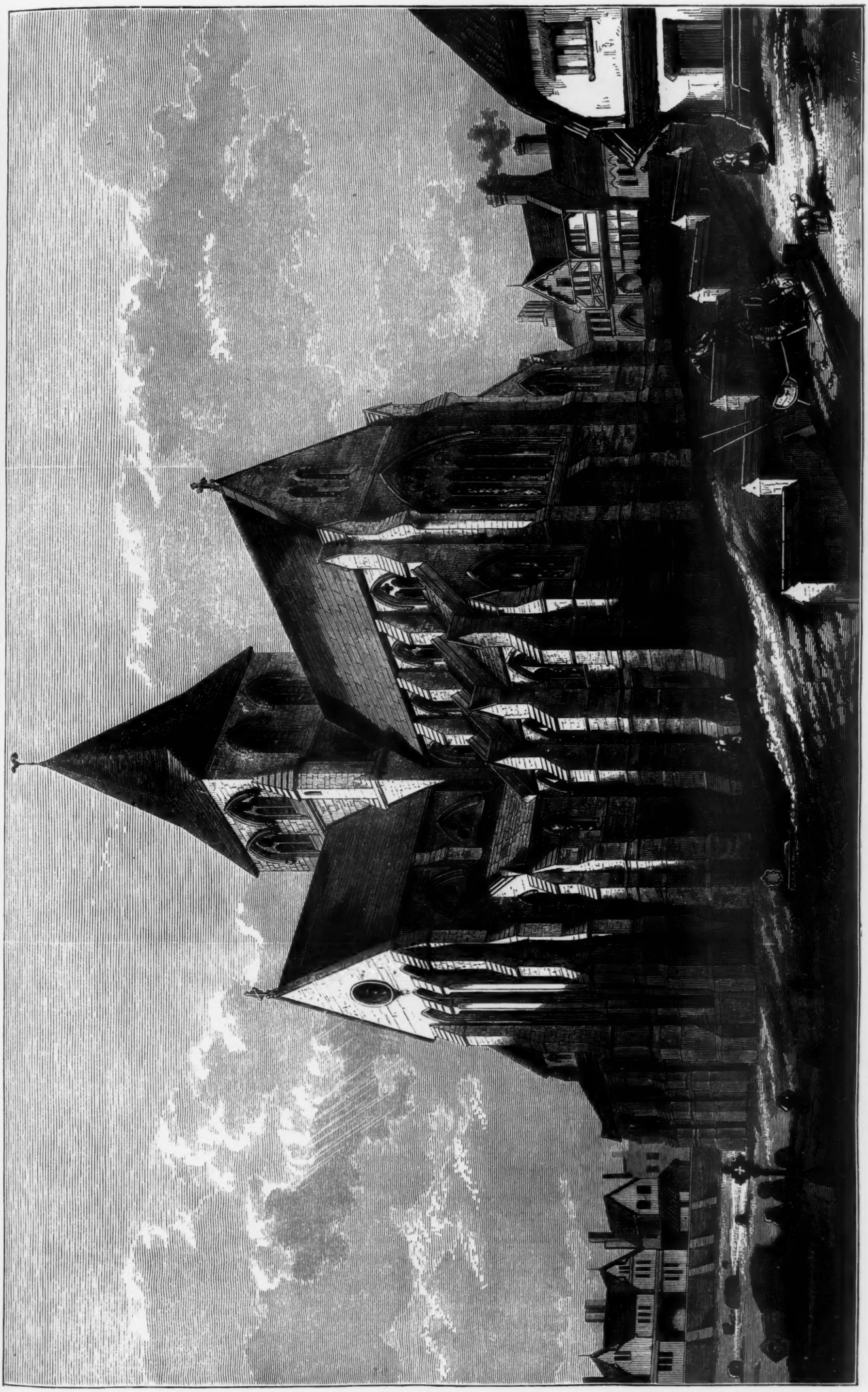
THE bath here illustrated, which has been designed and executed by Messrs. J. Fell & Co., of Wolverhampton, for the Melbourne International Exhibition, and for Messrs. T. & C. Clark & Co., of Wolverhampton, is remarkable in several respects. The design is worked out in finely-grained pollard oak, inlaid with light oak. This is carved by hand, and is a good specimen of workmanship: the back is inlaid with three large tiles, representing Neptune with attendant nymphs; the background behind each figure is in gold, the figures are painted in azure blue on white; they are the work of a well-known artist. The bath is of cast iron, and lined with T. & C. Clark & Co.'s patent enamelled porcelain. It is fitted with improved standing waste and overflow, with hot and cold supply, nickel-plated, and the back contains no inside fittings, and is perfectly clear and free from overhanging valves or waste roses and gratings. Access to the valves is obtained through a door at end, fitted with a patent catch.

We also illustrate a lavatory made by the same firm and for the same destination. The woodwork is of pollard oak, inlaid with light oak, the back being inlaid with a river scene, well painted; in the centre is a patent mirror, unfolding like the leaves of a book. The basin is a "tip-up," fitted with patent nickel plated self-closing valves; the top is a massive slab of St. Ann's marble, highly polished.

THE BIRMINGHAM CORPORATION AND EMPLOYMENT OF ARCHITECTS.

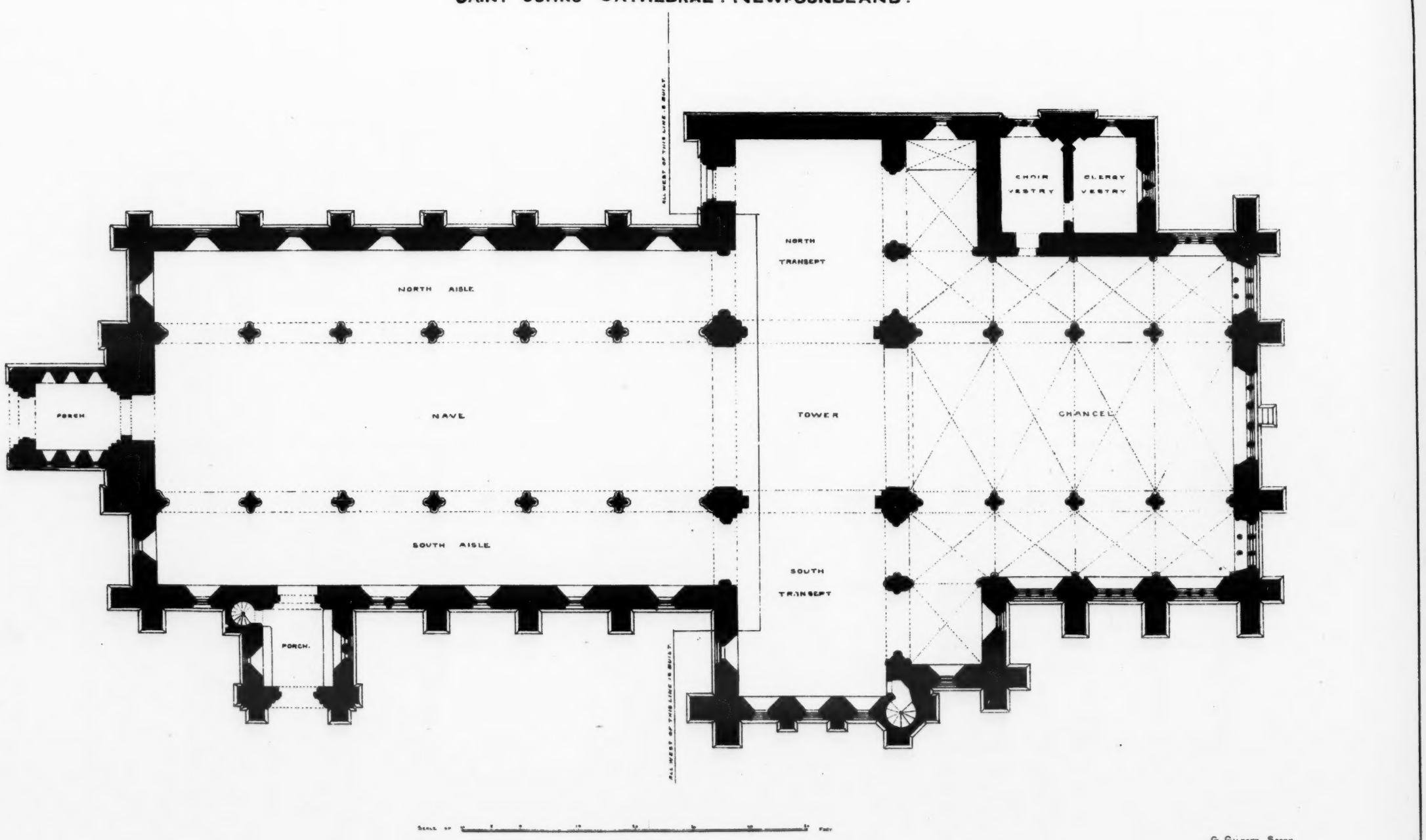
THE Town Council of Birmingham some time since referred to the General Purposes Committee for consideration the subject of the employment of architects in connexion with works carried out on behalf of the Corporation. The committee on Tuesday in last week brought up their report. They stated that the present practice was for committees who were instructed by the Council to erect buildings to employ such architects as they thought fit. The committee now recommended that this discretionary power should still be exercised by the various committees, except with regard to works the estimated cost of which exceeded 10,000*l.*, and that in the preparation of plans for which professional assistance was desirable, the several committees should obtain such assistance, either by advertisement or by inviting a number of architects to submit plans, one or more of such plans being selected by the committee for submission to the Council, with recommendations thereon.

The Mayor (Mr. R. Chamberlain), in moving the adoption of the committee's recommendation, said that they considered it would not be to the interest of the town to invite competition where the works would cost less than 10,000*l.* In the case of a building costing 5,000*l.* or 6,000*l.* the net profit to the architect would only be about 150*l.* The leading architects would not care to prepare plans



ST. JOHN'S CATHEDRAL, NEWFOUNDLAND.—THE LATE SIR G. G. SCOTT, AND MR. GILBERT SCOTT, ARCHITECTS.

SAINT JOHN'S CATHEDRAL: NEWFOUNDLAND:



G. GILBERT SCOTT
21 SPRING GARDENS
LONDON

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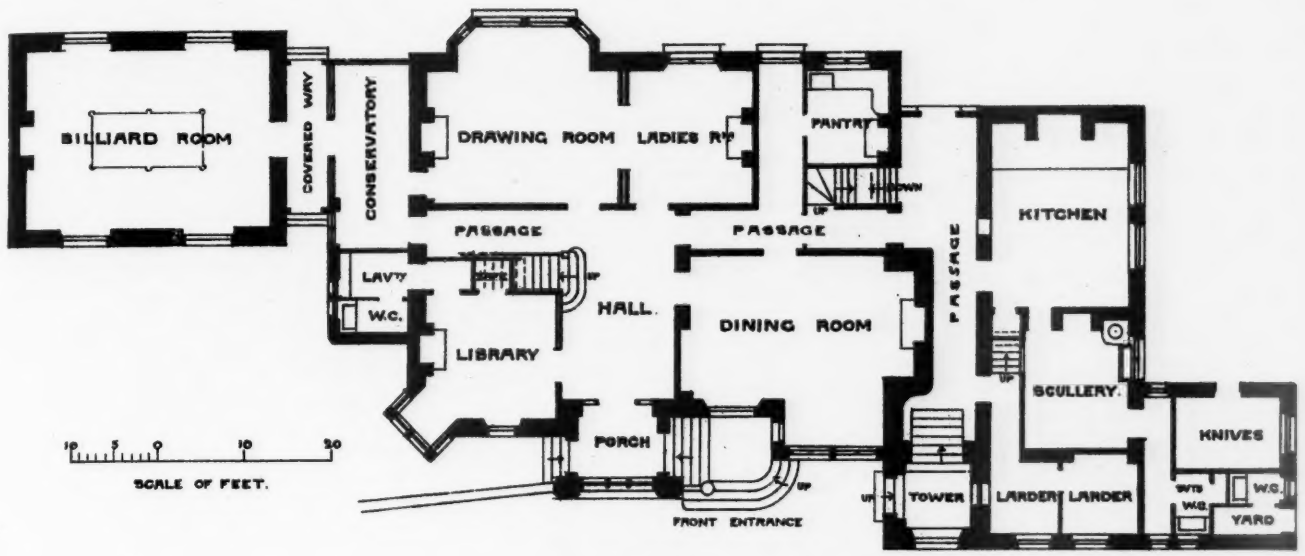
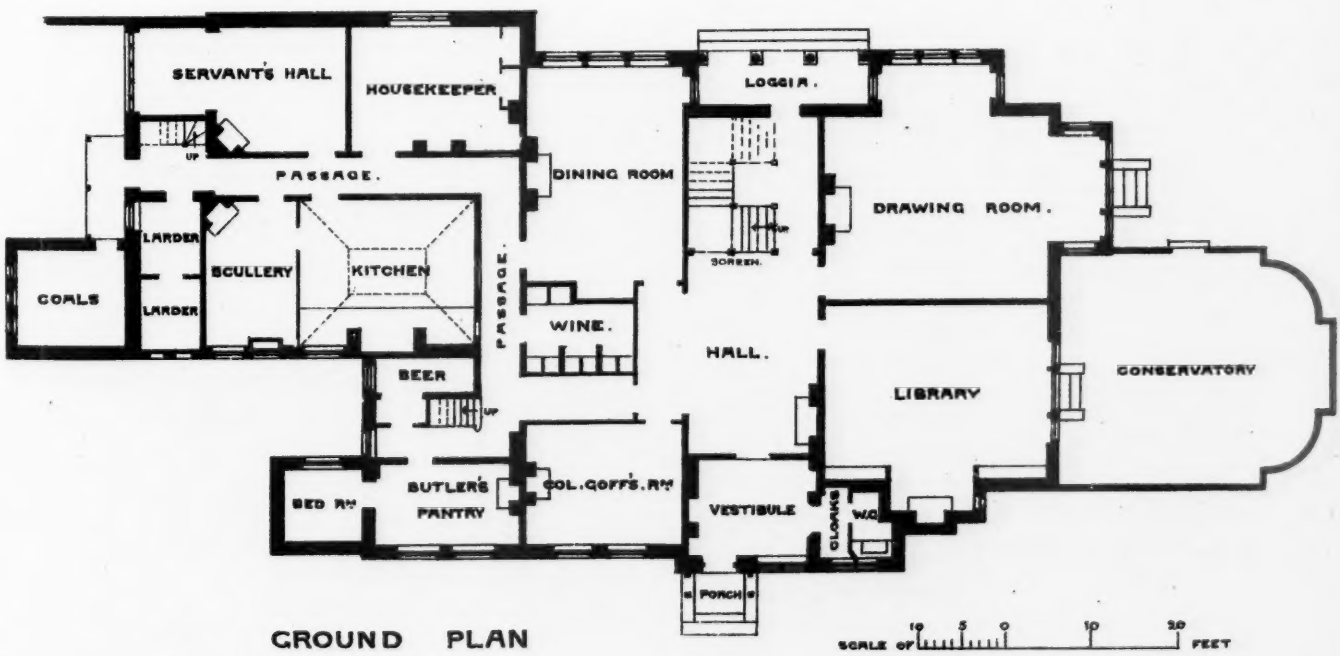


GROUND PLAN

PURBECK HOUSE, SWANAGE.



"EVERTON," NEAR LYMINGTON, HANTS.

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on the chances of competition in such a case, and hence the Corporation would only obtain competing plans from those inferior architects who had nothing better with which to occupy their time and attention. As to the suggestion of employing a borough architect, he was of opinion that the payment necessary to secure the services of a really efficient man would be a heavy burden on the Corporation, and there would not be the incentive to such an officer to do his best, as in the case of a gentleman who knew that if his design were not approved, the Corporation were at liberty to go somewhere else. The motion having been seconded,

Mr. Brinsley moved, as an amendment, that the report be approved, with the exception of the part relating to the limit of 10,000*l.*, and that 5,000*l.* be inserted in the place of that sum. He complained that, owing to the power possessed by Mr. J. H. Chamberlain, one of the principals in the firm of Messrs. Martin & Chamberlain, architects, the proposal to allow the various committees to have the choice of architects would practically amount to placing the thing in Mr. J. H. Chamberlain's hands.

Mr. W. J. Davis contended that the firm referred to got nearly all the work of the town. The Rubery Hill Asylum had been built by them; they had been architects and purchasers of sites for twenty-six Board schools, in respect of which they had received 2,000*l.* a year for the last eight years. They were architects for the Water Department of the Corporation; the Free Libraries had been designed by them; and they were the surveyors to the great improvement scheme. He (Mr. Davis) thought they ought to give a chance to other firms, and he supported the amendment.

Mr. T. Martineau repudiated in the strongest possible manner, on his own part, and on the part of gentlemen with whom he was in the habit of acting, the imputation that there had been any improper favouritism. He believed there was not a man there who would not, in the matter of architecture, as in other things, give his vote for what he considered the best interests of the borough, whether it favoured one individual or whether it did not.

After some further discussion, the Mayor said he wished to point out that whatever monopoly Messrs. Martin & Chamberlain enjoyed, it was one which had been earned by merit and genius alone. As regarded improper influence, he, as chairman of the council, protested against accusations of favouritism, cheating, or lying being lightly made against members of that body. If they were seriously made, they should be followed up, and the person found guilty should be expelled from the council. The amendment was then put, and lost by 46 votes against 9.

PARIS.

THE execution of the remainder of the statues destined to adorn the Hôtel de Ville has now been commanded. The 2,800,000 francs set apart for this purpose have thus been put into requisition. For each statue is paid 4,000 francs; for each caryatide, with its emblems (or attributes), 12,000 francs; and for the pediment, which is the work of Monsieur Gautherin, 30,000 francs.

The result of the votes to determine the election of the committee for the French *Salon* for this year is now known. There are at least 10,000 artists' names inscribed on the list of electors, but only about 2,500 have taken any actual part in the voting; that is to say, about 1,900 for painting, 300 for sculpture, 160 for architecture, 140 for engraving. The largeness of the number of those who have abstained from voting is due to two causes,—one, that the names of any one who had exhibited since twenty years was inscribed on the list, and that out of these several are dead, and others have given up the profession.

In the committee elected for this year we find, without exception, the names of all the members of the jury of last year. Every effort to introduce into the Commission persons not belonging to the artistic corporation has failed completely. The published list shows a return of painters, fifty names; sculptors, twenty; architects, ten; and engravers, ten; in all a total of ninety names. These will compose the Commission, which, in concert with the Government, will draw up the rules for the next *Salon*.

The Commission met for the first time on Monday last, at the Palais de l'Industrie.

SUBMARINE QUARRYING OF PHOSPHATE OF LIME: SOMBRERO ISLAND.*

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

IT is some years since the works about to be described were carried on, and having no notes to refer to, the Society will have to accept an account necessarily imperfect. It may be interesting, however, as there is a constantly-growing tendency to attempt works that require either the deepening of channels from which water cannot be removed, the deposit of foundations in such places, or the construction of tunnels through strata under water.

My connexion with Sombrero Island, West Indies, commenced in 1867, being then engaged by the Board of Trade to erect a lighthouse on the island, designed by Mr. William Parkes. This subject is referred to because it was the means of introducing me to the Sombrero Phosphate Company. The word Sombrero is the Spanish for hat, and was applied to the island because it was supposed to look like a hat floating on the water.

The Island of Sombrero stands in what is called the Anegada channel, leading from the Atlantic into the Caribbean Sea, and is exposed to the full force of the Atlantic waves, both from north and east. Owing to its small area, 80 acres, and low elevation, 10 ft. to 40 ft., the green water of the great rollers has gone completely over it; notably so in 1858, and many times have I seen nearly all the island submerged. The spray rises far above the lantern of the lighthouse, an elevation of 150 ft., and the wind carries it landward, deluging the island. The highest seas occur during the calm weather, and come from the north. One wave that I measured was 72 ft. from trough to crest. The vertical sides of the island, extending to great depths below sea-level, cause the exhibition of wave force to be unusually grand.

As to tides, there is little or no semi-diurnal; but at midsummer and midwinter the diurnal tide has a range of about 15 in.

The island is in the path of most of the hurricanes that periodically desolate the West Indies. I experienced that of Oct. 29th, 1867, and described it in a paper read before the Meteorological Society.

This leads me to explain that the surface of the island is devoid of vegetation, except a few prickly pears. The natural rock is very rough, and difficult to walk on, being worn by the spray into sharp points. Several large boulders are found strewn about; some on the highest part must weigh quite 40 tons, and one at a lower level at least from 150 to 200 tons. These boulders have evidently been broken off the face of the cliff and rolled inland by the waves. The sea-spray and foam eat away the rock a little above sea-level, and when it has been thus well undercut, portions are broken off and forced inland by the huge Atlantic rollers. Since the occupation of the island, a space of nearly thirty years, none of the large boulders have been moved, to my knowledge, nor have any of such weight as 40 tons been thrown up, notwithstanding the high seas that have been experienced during that period.

This leads me to the belief that, during recent times, the island has been at such a low level as to allow the waves to have greater power than now over the boulders. Other islands in the neighbourhood have sunk during historic times. In fact, the whole crust of the earth in the West Indies seems in a very unstable condition; the frequency of earthquakes, and the great number of extinct and semi-extinct volcanoes, are the certain and tangible evidence of such a state of things. The rock, of which the island is composed, results from a coral reef, or island. It consists entirely of carbonate of lime, except the comparatively minute qualities of phosphate of lime and phosphate of alumina that constitute its riches. Its texture is tough, and "backs" and crevasses occur. There are also smooth-sided holes 2 ft. to 3 ft. across, and extending downward in a tortuous way to a depth of 10 ft. or 15 ft.

Vast ages must have elapsed since the coral insects lived that formed this rock. If you look at the chart, and examine its present shape, and bring to your mind the laws that govern the formation of coral reefs and islands, you will at once perceive that, as hinted above, but a mere fragment remains of what once existed. What time, and what oscillations in level must have occurred, to eat away vertically the sides of this hard rock, none now can tell.

The island was once the home of pirates that preyed on the commerce entering the Caribbean Sea; but, much more important, it was the home and breeding-place of vast multitudes of sea-fowl. I have been told by old men in Anguilla that when young they went to it in search of eggs. Their method of proceeding was to fire off pistols to frighten the birds away from a selected spot, then sweep it clear of eggs and wait for a couple of days, when they found a fresh supply sufficient to load their boat.

If this island with its congregation of birds had been situated in a smooth sea on the Peruvian coast, it would have been piled up with guano, for there the air is dry and little rain falls. But in its actual position it is so deluged with spray, and the air is so damp, that none could remain except when caught in the holes and crevasses of the rock. However small this quantity may have been, from it has resulted in the course of time the phosphate of lime that has made this little rock so well known throughout Europe and America.

Not professing to be a chemist, any remarks made by me on the question of how the bird deposit gave rise to the phosphate of lime as we find it should be made with caution and humility. In this frame of mind I may state the conclusions I have come to after a good deal of thought.

The phosphate of lime, as we find it, occurs in some places in veins, in others in mass. It is of all colours, from ivory white to black; sometimes it is semi-transparent, of a yellow colour. It is always hard in texture, and generally crystalline. Sometimes corals, shells, and sponges have been converted into phosphate of lime.

In the holes above described is found a deposit of a soft brown earthy substance that consists to a great extent of phosphate of alumina; but the sides of these holes, and any pieces of carbonate of lime that have found their way into them, are coated with layers of phosphate of lime. This latter fact, uniformly occurring, has led me to be bold enough to hazard the following opinion, viz., that phosphorus having a greater affinity for lime than for alumina, it leaves the latter and combines with the former. No doubt there is phosphate of lime in the bird deposit that would not require to go through this process. But it must have got into solution before it assumed its present form, and while in solution it would be liable to be washed away in its entirety, as only coming in contact with carbonate of lime it would not have a tendency to leave one of its constituents behind. It is much easier to believe the phosphate of alumina in solution parting with its alumina and the phosphorus combining with the lime of the matrix rocks, and so forming the phosphate of lime we find. It must be evident, then, if this hypothesis be correct, that we have remaining on the island but the minutest remnant of the vast quantities of deposit made during past ages.

As before stated, the island from remote periods has been the haunt of pirates, and visited by those in search of eggs. But in course of time some American naturalists in their wanderings discovered the deposits of phosphate of lime. These were worked by an American firm for some years, during which large profits were made, as they obtained the phosphate at a low cost of quarrying, till they reached a depth of 2 ft. below water-level, which is uniform with that of the sea, the rock being porous. At this level they gave up working. Three circumstances combined at last to draw the attention of the English authorities to this island; they were,—the large profits of the American adventurers; the hoisting by them of the American flag; and the necessity of having a lighthouse erected to guide vessels entering the Caribbean Sea.

The English Government at last enforced their rights by hoisting the national flag, and giving a lease of the island to the Phosphate of Lime Company. This company was dissolved, and the Sombrero Phosphate Company took over the lease. Not having seen this document, I can only state the principal items to have been the payment of rent, the Government reserving sufficient land for the lighthouse, and that the tenants should keep order. The island not forming part of the territory of any colony, the superintendent of the company has magisterial control of all individuals on it, and of vessels in the roadstead.

Consulted by the Sombrero Phosphate Com-

* From a paper by Mr. R. Harkness Twigg, M.I.C.E., read on the 8th inst.

pany during the time I was erecting the light-house, I could not disguise the fact from them that the legacy left the English Company was poor in comparison with the virgin wealth the Americans found. I came to the conclusion that the only profitable way of working was to extend the use of machinery, and continue the former excavations under water.

Having completed the erection of the light-house I returned home, and at my suggestion the company purchased and sent out a large quantity of plant. While at home I inquired into the question of explosives; for, from experience, I deemed gunpowder unsuitable in this case. At this period a strong controversy existed between the advocates of gun-cotton and dynamite. Gun-cotton at that time could not be exploded unless confined, which did not quite meet my requirements, as I intended to adopt the system of submerged surface blasting, *i.e.*, simply placing the charge on the surface of the submerged rock without boring a hole. The object of this was to save labour and expedite the work. After consultation with Messrs. Prentice, the manufacturers of gun-cotton, a cast-iron shell was devised for holding the charges, and causing them when fired to exert their full power. This answered very well, but I found that it would be almost impossible to get freight for loaded shells, and I would not undertake the risk of charging them on the island; however, a considerable quantity of gun-cotton was sent out, a few uncharged shells, and some dynamite.

The preference given by me at that time to gun-cotton in comparison with dynamite, had no reference to their relative efficiency as explosives, but arose from the process pursued in their manufacture. The gun-cotton, being pulped after the nitric acid is applied, is of necessity thoroughly cleansed from any acid that might remain free, and is therefore, from that cause, not liable to spontaneous combustion; whereas in the manufacture of dynamite there existed no such guarantee, the elimination of free acid depending on the fidelity of the workmen in the factory.

The object in working, as about to be described, was not so much to get phosphate at the minimum cost per ton, as to get the maximum quantity in a limited time, without thereby unduly increasing the cost per ton. The result eventually arrived at was that the output was doubled and the cost per ton considerably reduced.

It will be remembered that when the Americans left off working, there were 2 ft. of water in the quarries. The process pursued for getting the phosphate that lay deeper was to drill holes and blast with powder and gun-cotton enclosed in tin tubes till a depth of 5 ft. or 6 ft. was reached, the loosened rock being removed by naked divers. To carry the excavations deeper still, cans containing a charge of 5 lb. of gunpowder were placed in the bottom and exploded with fuse or the galvanic battery. It was found by experience that 5 lb. of powder in this depth of water was the heaviest charge that could economically be used, and the rule adopted was to increase the weight of the charge in proportion to the square of the depth. This method of blasting was continued till a depth of 10 ft. was reached, and the loosened material was removed with naked divers as before.

Blasting at a greater depth than 10 ft. was performed still by explosives placed on the surface of the rock; but gun-cotton was, as a rule, substituted for gunpowder, the heaviest charges used being 7 lb. of the former, and 20 lb. of the latter, and the greatest depth of the excavation was from 25 ft. to 30 ft. Several methods of raising the loosened material were adopted,—(1) by means of ordinary helmet divers, the apparatus being supplied by Messrs. Siebe & Gorman; (2) by means of a wrought-iron diving-bell, about 9 ft. long, 2 ft. 6 in. wide at the bottom, 15 in. at the top, and 3 ft. deep, weighted round its lower edge with slabs of cast iron. This bell was found very cumbersome, and required strong tackle to lift it out of the water. Besides it was, till the defect was remedied, to some extent dangerous, by means of the violent oscillations that occurred when the compressed air escaped, as it always did at the ends. The remedy devised for this, and adopted in all bells afterwards, was to make a small hole a little above the under-edge, so that the air, after driving out the water to that level, escaped quietly in a constant stream. However, with this long-shaped bell, anything causing one end to be much higher than the other led to the old oscillations, and eventually, at the urgent request of the men, it was abandoned. (3) By means of wooden diving-bells, made of 2-in. plank, and weighted with old chain wound round them, supported on bent iron bars. These were found very handy, as the chain could be unwound off its supports, when it was required to take the bell out of water, which was not often, as the naked workmen dived down underneath the edge and came up inside. (4.) Another form of wooden bell was used in a small quarry where there was only one weak derrick for hoisting the excavated material. This bell was supported on legs like those of a table, and the hole for allowing the air to escape was made higher up than in those bells described above, to prevent any chance of the bell lifting. When it was required to move this bell, all that was necessary was to plug the hole till sufficient weight was taken off the legs by increasing the air space, to enable the small derrick to move it while under water. An accident happened to this useful apparatus in its early days. The workmen, not being aware of the effect a submerged blast in its neghbourhood would have, fired one while the bell was under water. The result was a wreck, which was speedily repaired, the apparatus being very useful. (5) Amongst the general stores sent out at my suggestion from England were a considerable number of hoisting buckets, 2 ft. 6 in. in diameter, and 2 ft. deep; some of these, small as they were, I converted into bells, by turning them upside down, and bringing the bandle over the bottom to sling them by. Then, as in the case of the wooden bells, old chain was wound round, and the air-hole drilled. The theory I acted on in this case was that a naked diver, obtaining air from these bells when submerged, would be able to continue at work longer under water than if he dived from the surface with his lungs filled with air at the ordinary pressure. The result proved that I was correct, and, further, time was saved, as the men could have the bell where they wanted, whereas without the bell they would have had to go to the surface to breathe. In some cases these bells were suspended from a wire rope strung high over the water, in others from short derricks on a punt. Excavation could be carried down, with such men as I employed, to a depth of 30 ft. in this way.

The naked divers, whether working from the tub bells or from the surface, carried with them a sheet-iron vessel like an old-fashioned coal-scuttle. Lying on the bottom with this against their chest, they filled it by scraping into it, with pieces of sheet-iron they held in their hands, the broken stone. In shallow water they walked out with the scuttle full, in deep water they emptied it into a hoisting box or tub. The extent of the work may be judged, when it is stated that forty helmet divers were daily at work, forty men in diving-bells, and sixty naked divers working without any kind of apparatus. This has reference only to the submarine department; on dry quarry work there were many others engaged, the whole gang numbering 400 on an average. To economise labour to the utmost, the air for nearly all this apparatus was compressed by a double-barrelled air-pump, the barrels being about 5 in. diameter, and the stroke about 2 ft., driven at 60 strokes per minute by a steam-engine, and stored in an old steam boiler, from which it was conveyed through gas-pipes to various parts of the works. Storing the compressed air thus allowed of the engine being stopped for a few minutes without calling the divers up. The engine was worked to its full power, being set to do a number of things, not only to save labour, but, by condensing the steam, to give a supply of fresh water, saving, I have been told, 5,000*l.* per annum, the previous expenditure on water.

The experience gained by practice at Sombrero in the use of gun-cotton led to extended knowledge of its properties. It was stated above that when I left England gun-cotton could be only exploded if confined in a shell or bore-hole. Shortly after, Professor Abel, of Woolwich, found that if it was ignited with a strong charge of fulminate of mercury it would detonate without being confined. I had a large supply of such exploders sent out, and with this help got on very well with the cotton charges for submarine work, having made special arrangements with Messrs. Prentice to supply charges for this purpose of from 3 in. to 7 in. diameter. These were made up of round, flat cakes, having a central hole to convey the fire throughout the mass; they weighed up to 7 lb., and were each enclosed in a neat brown-paper wrapper. It was usual at first to enclose these in tins before putting them under water; but one time running short of sheet tin, it occurred to me that all that was necessary, now we had fulminate exploders, was to keep the water from the charge. This the tin did imperfectly, as the pressure of the water often broke the cans. I resolved to try the experiment of coating the charges outside the brown-paper wrapper, with a waterproofing composed of boiling pitch, lime, and sand. With the view of creating confidence in the charge-makers, that no danger was to be apprehended from putting the cotton into the pitch-pot while there was a strong fire under it, I made the experiment myself, they looking on in terror. It succeeded as I felt confident it would. After much disputation, a regular method of doing the work was arranged, and, to my knowledge, no accident has ever occurred during the operation of waterproofing. Charges thus prepared were thoroughly efficient, and tin-smiths and tin-plates became unnecessary.

While writing about Sombrero, it may be interesting to describe a simple way in vogue there of burning lime. A hollow, about 18 in. deep and 10 ft. or 12 ft. diameter, is made in the rock; across this, on the bottom, are laid two trunks of trees, about 10 in. diameter, and 2 ft. apart. The space between these is filled in with brush-wood, laid crossways; over these are branches to a depth of about 1 ft., then a layer of 6 in. of rock; on this is sprinkled a little small coal, over this about 2 ft. in depth of stone, then a little more coal, and so on, till a height of 8 ft. or 10 ft. is attained; the whole is then covered up with stones, lighted, and tended, to prevent the heat escaping faster from one part than another. When the stack gets cool the limestone inside is found to be thoroughly burnt, and the outside stones are dried ready to form the centre of the next stack.

A STRANGE ARCHÆOLOGICAL JOURNEY.

ACCIDENT the other day elicited from the proprietor of a shoe-black box plying his trade in Albany-street, Regent's Park, that he had a great fondness for archæology, and that on one occasion, to gratify this feeling, he had made his way to Stonehenge and Kent's Cavern without a shilling in his pocket. Finding we were interested, he offered to try and write an account of his journey. This he has now sent us, and we print it without any alteration whatever. We may add that we are satisfied as to the truthfulness of the story.

It was on the 15th of August, 1877, that I went upon the journey of which I propose to tell you; but, as my manner of going was rather questionable, I think it but right to say a few words in explanation, before I start. The fact is I was in that peculiar position in which it is impossible for a man to *lose* anything. I was out of work, out of clothes, out at the heels, out at the toes, out of money, and in debt. And, moreover, I was out of a lodging; and, furthermore, I was fifty-seven years old; and in addition to all this, I could see no prospect of getting anything to do,—for where there are twenty young men knocking at the shop-door, what in the world is the good of an old fellow calling? So, finding myself thus situated, it struck me that now was the time to satisfy the desire of my heart, as far as in me lie; and since I could now have no hope of seeing Rome, Egypt, &c., to be content with Stonehenge and Kent's Cavern, and go for them at once. And this I did without more ado.

It was ten o'clock on the morning of the 15th when I started, and the weather was beautiful. I had ninepence in my pocket, all told; but I also had a toy mouth-harmonium, from which I expected great things, and upon which I could play two tunes,—"Rock of Ages" and "Twinkle, twinkle, little star." I went through Shepherd's-bush to Acton, where I spent twopence in bread and cheese, and then through Hanwell, Heston, across the Bath-road, and into the Staines-road. Egham races were on, so it was pretty lively down there, and I almost forgot my own lonelyness while I was passing through the gay multitude; but when I had left them far behind me, and the merry sounds died away in the lengthening distance, such a strong feeling of melancholy came over me that I stopped and was a good mind to turn back. I sat down by the roadside and had a good smoke, that I might the better consider the subject; and eventually, pursued my journey with re-

newed courage, but did not reach Bagshot—twenty-seven miles—until eleven o'clock that night. I had sevenpence still, and intended to have a bed that night, but the lodging-houses were closed; so I curled myself up upon the softest doorstep I could find, and made the best of that. I dozed, and dozed, but I did not enjoy it much, and was very glad when the day broke. Then I got up and went on for Basingstoke. It was four o'clock when I resumed my journey, and, being so early, I was unable to get any breakfast until I reached a long straggling place some miles past Blackwater, where I spent my sevenpence in as good a meal as I could get for my money, and that wasn't very good, for they seemed to know how to charge there.

Barford Bridge flats was one mass of purple bloom when I passed that morning. The common, as I should call it, is some five miles across, and, to me, it was a grand sight. I lit my last pipe here, with my last match! (this is a very serious event to a poor traveller, I can tell you) and then loitered away towards Basingstoke, where I arrived at about five o'clock. Here I was driven to the necessity of playing my musical instrument, and after a very hard struggle, I persuaded myself to walk into the road and strike up; but after playing in every quiet street I could find I only got three-halfpence; so I spent that in ale, and then went into the Workhouse for the night, out of which I came at three o'clock on the following afternoon, with my hands all blistered and bleeding from using the iron bar which they gave me to break stones withal. So I got no further than Whitchurch that night, and slept by the side of a pathway just outside that town,—a pathway raised high above the road,—and, early next morning, trotted on to Andover. I was only eighteen miles from Salisbury now, but I was very faint and famished. However, I succeeded in earning a few halfpence as I went along, although, at the last attempt, I had the mortification of discovering that I had blown all the music out of my poor instrument! So there was an end of that means of support.

I reached Salisbury before sunset with a penny in my pocket, which I expended in a faggot, and then went and found my road for the Plain; and having found it, hid myself in one of the hedges by the roadside, there to conceal myself preparatory to my visit to famed Stonehenge the next morning. It was Saturday night, and at nine o'clock a peal of bells rang out from some church,—the Cathedral, perhaps,—and while they were ringing I went to sleep. It is wretched sleeping in hedges, I assure you. Indeed, you don't sleep much; and oh! you are so glad when the blessed sun rises above the horizon to cheer and warm you! I was glad to get up by daybreak, for I was benumbed with cold, and soaked with the dew; but the object I had in view, and a sharp walk, soon made my blood warm, and by the time I reached the Plain the sun was well up in the heavens, and I was as happy as one could expect to be under the circumstances.

Of course, I had no idea in what direction to look for Stonehenge, and, until I was returning in the afternoon, I did not see a single soul to direct me. I passed the Druid's Head without observing the wheel-tracks which, I afterwards accidentally discovered, led to the famous temple; but, although I must have got on to the Plain at five that morning, I did not stand within its shadow until broad noonday.

Whether it was my bodily weakness and over-exertion, or whether it was the intense solitude and silence that so overpowered me, I cannot say, but a strange feeling of awe came upon me as I stood reverently gazing on the mysterious pile, rendering me as weak as the merest child. After a while, I certainly mustered courage enough to enter the great circle, doing so with head uncovered, as though I were entering a church; but I could not stay many seconds. There was a weirdlyness about the whole scene. The temple itself,—the great grassy mounds (ancient burial-places, I believe),—visible in the distance, that surrounded it on every side, these joined with the dread solitude and silence of the Plain, impress me so strongly and strangely that I shall never forget that day so long as I live.

I got back to Salisbury that evening, and went and sat under an old-fashioned "shelter" in the Market-place. I had had nothing that day but a few elder-berries, which I found growing on the Plain. I was tired and hungry; so being desirous of shunning the tender mercies of another Union, I threw myself into the arms of the police; and it was lucky for me I did so, for the Inspector acted very kindly towards me. He provided me with a lodging, telling me to see him next morning, and he would see what he could do for me. This I did, when he gave me a pair of boots (mine were all gone to pieces), and, on condition that, if I got no work, I would leave the town that night, he also gave me a shilling. Dear, dear! What a difference between the charity of the Station House and that of the Workhouse! I should hardly have thought it! I presented that kind Inspector with a little book, yclept "Bill Brown's Sunday Out," and having restored the inward man with a good "go in" of bread and cheese and beer, I, true to my contract, bade farewell to Salisbury and its beautiful Cathedral, and went for Devizes,—about twenty-one miles,—right across the Plain. It was rather late when I left the town, and it had been my intention to pay another visit to Stonehenge, had it been a moonlight night. But it was quite otherwise,—the sky was heavy, and by the time I reached the Druid's Head, it began to rain a little. I had fourpence, so I went in and had a half-pint, lingering over it so long that when I came out it was quite dark; and as I had some fifteen miles to go, of unfamiliar and solitary road, with very little chance of finding shelter,—or even of meeting with anybody,—why, my prospects were not rosy.

It came on to rain sharp when I had gone some three miles, and I was glad to shelter under some shocks of oats in an oat patch close by. There were several scabby patches of oats and mangles on the plain, but this was both the first and last one that I was *glad* to see. Sir John Lubbock's Bill has my best wishes, for if the busy husbandman is not baulked quickly, he will break up the sacred stones of Stonehenge to build his pig-styes with. I can't say it was a comfortable bed I had among the oats, for the shocks kept slipping from over me and from under my head. Besides, the stubble on which I lay was sharp, like so many fork-prongs upwards. The only consolation I could find was, that I was not in a "Union," and that I still had 3d. in my pocket with which to start off in the morning. However, after a while, I slept soundly, and when I awoke the thistles and blue-bells were sparkling in the sun like jewels; and as I looked around me over the plain, I felt a sense of freedom and independence that was as pleasurable as it was new to me. I started several hares and one or two flocks of birds, as I went along, and in about a couple of hours I came upon a row of five or six cottages, at the nearest of which I procured a first-rate breakfast for my remaining 3d. I reached Devizes about mid-day, and at once commenced looking for an employer in my line, whom I had erroneously supposed to be in business there. I, of course, made inquiries at many places. This brought a policeman "down upon me." He tore my coat, and broke one or two buttons from their fastenings, and then let me go, admonishing me "not to do it again,"—but what the thing was that I was "not to do," he scorned to inform me. It was perhaps too much to expect from him. So I tied my torn garments up with some bits of string, and went my way. I slept in a "lenney" (out-house) that night, and next day got into Bristol. I went to Bristol, for I knew there was a master in my trade there. I went there to try and get a few days' work, for as I could not beg, would not steal, and was so prejudiced against the "charity" of the workhouse, I felt I should never get to Kent's Cavern if I didn't take care. So I got over the twenty-eight miles as sharply as I could, and at eight o'clock that night I was in the shop of, and talking to, Mr. G. Stevens, Goldbeater and Herbalist, Market-street, Bristol. Mr. S. could give me no work, but he gave me 2s. "to help me on the road," and, as is the custom in our trade, his men very kindly got up a subscription for me. I stayed in the city one day, visiting Clifton, having a good look at the ruins of the Castle, and starting off again the following morning with 5s. in my poke, bound for Wells. It was a very wet day, and I had to "put up" and put up, so often, that I only got as far as Porlton, twelve miles, and what with the "putting up," and my bed, and all, I discovered, to my grief, next morning, that I had run through a whole half-crown! So I resolved to be more economical in the future.

I reached Wells just as the "Houses" were opening (it was Sunday), and I entered a "Public" in Sadler-street on the right, and called for bread and cheese and beer, but was so fortunate as to get a nice plate of roast fowl, turnips, and potatoes, for my dinner instead. The fact is, that when I got into the room, with a lot of people eating of the aforesaid dainty dish around me, I could not touch my humble meal at all; but there I sat, with my elbows on the table, the picture of discontent. The landlady must have noticed this, and took pity on me, I suppose; for, presently she came straight over to me, and, placing a steaming plateful of the tempting viands before me, "begged my acceptance of them." When I left that Public-house,—I wish I knew the sign of it,—it stands on the right of Sadler-street, as you enter Wells,—when I left there I went to have a look at the Cathedral, and then went on to Glastonbury, and slept at a "Travellers' Kitchen" there, kept by a wooden-legged man named Curtis; and next day I went through Langport, and on to Westport, where I slept. I got to Chard the following night; I also got to the bottom of my pocket, and, I feared, to the limit of my strength; for when I arose in the morning, I felt that I could go no further. My legs threatened to go on strike, and my heart beat against my ribs like a rat trying to get out of a trap. But they told me, that when I got to the top of the hill (the highest land in the West country), I should see Devonshire,—beautiful Devon! This I considered worth a struggle, even if I had to return and "cave in," which I did not mean to do if I could help it, as I was now only fifty miles from Kent's Cavern. So, by taking it very easily, I contrived to get to the top of the hill, but was glad to rest upon the seat which good men have put there, and fools have cut to pieces. I gathered some fine blackberries there, but had to go a good distance over the top of the hill before I could see Devonshire; and then, with my eyes delighted by wandering over the fair scene before me, I commenced to go down on the Devon side, and I never returned to Chard at all, but went right on to Exeter,—going through Yarcomb, Honiton, &c., and arriving in Exeter,—twenty-eight miles from Chard,—at eleven p.m.

I had had nothing but blackberries since the morning, and I was very faint and tired—I needed rest sorely, but I was in a fix how to get it. However, remembering how kindly I had been treated by the police, I decided on seeking the shelter and rest I needed among them in preference to appealing to any other source, and in a few minutes I had passed under that heavy portico which looks as though it had once been a town-hall, and was—with very little ceremony—shown into a "room," *all to myself*, and a bed ditto. Certainly the bed was only wood, and I own that I was locked in; but then again, they asked me "What time I wished to be called," and called me at that time punctually. But when I went out of that Police Station I felt like a Man,—whilst, when I came out of that other place, I felt like a whipped dog,—degraded, and full of spite and malice!

Torquay was only twenty-four miles now—that wasn't much. But I had been a day and night without food already, and I doubted whether I could do it. Nevertheless I couldn't think of giving in now; so away I went for Dawlish, arriving there just as it was getting dark. I sat down on a doorstep in the town, and I wished the police would take me up for something or another, I didn't care what. I was such a very helpless fellow to go on tramp! I couldn't beg, I couldn't steal, I couldn't dance, I couldn't sing; and I hated the sight of a workhouse. I don't suppose such a fool as I ever before went on such a journey! But I should have been just as bad off in London, and *there* my misery would have been *known*,—here it was not known. This was a great comfort. So on I went towards Teignmouth and Newton Abbot, and after many sittings down, and several sleeps on the wet grass, I reached Kent's Cavern, Torquay, on the 1st of September,—more dead than alive. Yes, there was the famous cave before me, where, they tell me, men had lived, and loved, and fought, and died, two hundred thousand years ago! I stood upon the *débris* of the stalagmite flooring, which had been thrown outside by the explorers, and when I entered the cave I did so on a plank which went from the entrance into the darkness. And it *was* dark, too! I could see nothing whatever! and I hadn't the price of a farthing dip in the world! I was very disheartened at this, and I turned away and went and sat down on a seat in the Babington-road, and there I must have fainted, I suppose, for, when I came to, several people were around me, and one of them gave me a drop of brandy.

This was the end of my journey,—and also

very nearly the end of me. I was so weak that I could scarcely walk. So, after having a good look at Torbay,—beautiful Torbay!—I collapsed altogether; and they sent me to Newton Abbot Union (Mr. Moseley, master), and after a time he packed me off back to London, where it's most probable I shall stay, for I shall never more be able to do such a tramp,—never! E. F. ALVIN.

DESIGNS FOR GOLDSMITHS' WORK.

THE designs sent in competition for the prizes annually awarded by the Goldsmiths' Company are this year exhibited not, as heretofore, at the Architectural Museum, but in the Architectural Court of the South Kensington Museum. Besides the designs for articles of plate service, there are some for equestrian figures, apparently not restricted to any special subject further than that they each represent a man on horseback: one an Arab horseman, one a mounted Life Guardsman, and so on. They are small plaster models, the horses standing about 9 in. or 10 in. high. The largest prize of 50*l.* has been rightly awarded to the group of a "Cavalry Officer of the time of George I.," by Mr. Harry Barrett, a work very dashing and spirited in action, and more successful in the modelling of the horse than the others, though the position of the horse's head seems rather forced.

In the designs for plate, which include branch candlesticks, hand-mirrors, forks and spoons, salt-cellars, tea-kettle and stand, &c., we find the best prize, 40*l.*, given to Mr. Bradburn for a candlestick design, which has the special merit, besides being elegant and well drawn, of showing a really suitable metal treatment. In some of the other designs we find, as we found on other occasions, too much of the application to goldsmith's work of architectural details, often not of a very good character as such, and suggesting no character special to the material used. Among other premiated designs are a silver tea and coffee service by Mr. H. Stannus (20*l.*), a hand mirror by Mr. E. Beresford (10*l.*), forks and spoons by Mr. J. R. Duffield (15*l.*); these last are very rich in appearance certainly, but the ornament does not seem to us distributed with sufficient reference to the use and meaning of the object. It always appears to us a mistake to ornament elaborately that part of any utensil which is to be grasped by the hand,—that is, the working part of it, so to speak,—which should be left plain, and thus the more fit for its utilitarian duties. Some of the designers of tea-kettles have remembered this, some have not, and have given a handle to grasp which must necessarily be uncomfortable for the hand, and does not indicate its purpose. Prizes for tea-kettle designs have been given to Mr. R. Needham (20*l.*) for a suitable but not very original design; to Mr. Herbert Singer (10*l.*) for a design which shows a good deal of originality, but which is rather stiff in its lines; and to Mr. F. Gibbon, for an elaborate and well-drawn design, rather too crowded with ornament in every part.

We should be glad to see competitors for these prizes aiming more at the form and character specially suited to metal work, and also paying more attention to characteristic form and outline, which is, after all, more important in such work than merely applied ornament. Many of the designs which we see from year to year only suggest the idea that an ordinarily-used outline for the object designed has been adopted, as a precedent, and then ornament applied to it; and often the ornament is without any reference to the use of the object, or to the form and relation of the various parts. The former condition is not a *sine quâ non*, of course, but the latter is. The decoration should be distributed and proportioned so as to emphasise the points of the form of the object, and add to its expression. And this condition is often better served by leaving some parts plain than by covering the whole with ornament indiscriminately.

Land in the Suburbs.—The extraordinarily rapid extension of the London suburbs is shown by the fact that during the year 1880, in the parishes of Hampstead, Willesden, Hendon, Finchley, Hammersmith, and Barking, one firm of land agents (Messrs. Baker & Sons), have sold for immediate building purposes 482 acres of land for an aggregate sum of 225,216*l.*,—an average of nearly 500*l.* per acre.—*Land Agents' Record.*

ROMAN LONDON: TREASURE TROVE.

AT the last meeting of the British Archæological Association, Mr. Loftus Brock produced a plan, and described the remains now being excavated on the site of Old Leadenhall Market. Two long walls of the fifteenth-century building are visible, with a series of corbels. A Roman pavement of ordinary brick tesseræ has been found over a large part of the surface, and covered with the ashes of some great fire. Above this is concrete of a second floor, while below, the remains of walls, 5 ft. thick, have been found, indicating a building of importance. These walls have bands of Roman brick, and one is constructed entirely of that material, pointing to an early period of the Roman occupation.

Mr. Grover, F.S.A., referred to the constant finding of traces of a great conflagration in London, which he considered was from the burning of London by Boadicea.

The first paper was by Dr. Wake Smart on "Roman Remains found at Nursling, Hants."

The second paper was by Mr. G. R. Wright on "The Hardship of the Present Law of Treasure Trove." After referring to the reason of the law in former days, namely, to help the king, and to assist the revenue, with the punishment of death for evasion, the lecturer passed on to these altered times, when its operation caused either the loss of art-treasures by their being broken up by the finders for concealment, or the stoppage of works of research. He instanced the case of the Saxon Cemetery at Longbridge, which was in course of excavation by the owner, when certain articles of value found were claimed by the Treasury.

BUILDING IN TRINITY DISTRICT, EDINBURGH.

BUILDING operations of a very extensive kind have lately been carried on, and are still being pushed forward, in this suburb of the Scottish capital. The extension of railway facilities has here, as in so many other instances, hastened the work of the builders. The buildings (says the *Scotsman*) have not been confined to one portion of the district, but extend from the Granton-road to the New Cut at Newhaven, embracing Laverockbank-road and the other thoroughfares which intersect the Trinity district proper. When to the houses which have already been built, or are in course of erection, are added the many signs of increased activity in the form of ground advertised to be feued, it may be inferred that the area promises to be fully occupied before many years are over. Four or five tenements, four stories in height, and consisting of houses ranging in rental from 35*l.* to 45*l.*, have been completed at Goldenacre, opposite the toll, and having the main frontage to Inverleith-row. Going westward along the main road towards Crewe Toll, a number of the new villa residences can be observed, while at the head of the Granton-road, and immediately facing the broad roadway which leads to Edinburgh, is a church, now nearing completion, intended for the congregation of Granton and Wardie Free Church. The edifice, which has a square tower, is a prominent feature in the architecture of the district. At the other end of the Granton-road, are a number of four-storied tenements known as Bayton-terrace. House accommodation in Granton is not very plentiful, which may account for the erection of such high buildings in an exposed position like this. In all, eighty families, principally of the working classes, are accommodated, all of whom will have, at present, a fine prospect towards Corstorphine. There is some talk, however, of the construction of other houses on the opposite side of the road, in ground which has been laid out for feuing purposes. Behind the block of dwelling-houses and shops lying near the Trinity Bridge is a large extent of ground which has of late been greatly in demand by those wishing to erect houses of a superior kind. At a street known as Lomond-road, which is fronted by a large park, have been erected eight or nine villa residences, the majority being three stories in height, including attics. At one of the main corners Messrs. A. & W. Fingzies are erecting a mansion, consisting of three flats, and on the roadway running from the manse towards the Episcopal Chapel three large houses have been erected. A row of first-class single villa residences has been placed on the west side of the road leading from Trinity Bridge, and in the intersecting area buildings of a smaller kind are in course of erection. What seem the most important operations in the district are to be found in Laverockbank-road, within two minutes' walk of the tramway terminus, where Mr. W. Outerson, builder, Edinburgh, is erecting a large number of dwellings to the order of the Scottish National Heritable Property Company (Limited). The houses number eighteen, sixteen being of ordinary size, and the other two, which face the main road, being of a more valuable character. The smaller houses each consist of a ground-floor and attics, containing a drawing-room 15 ft. by 13 ft., dining-room, three bed-rooms, dressing-room, and all other conveniences. The cost of each house is estimated at 600*l.*, and it is expected that the rents will range from 35*l.* to 40*l.* The larger houses facing Laverockbank-road will cost about 1,000*l.* The contractors, who are stated to have devoted great attention to the matters of drainage and ventilation, intend to have all the houses ready for occupation by May. The row has been built from designs by Mr. Hippolyte J. Blanc, architect, George-street, Edinburgh. At a short distance from the Stanley-road, two large houses, consisting of three flats each, have been constructed, and other two are in course of erection. Other buildings in the neighbourhood are being proceeded with.

ROYAL ARCHITECTURAL MUSEUM AND SCHOOL OF ART.

THE annual distribution of prizes in connexion with this institution took place on Wednesday evening last, Mr. J. P. Seddon presiding, in the absence, through indisposition, of Mr. Beresford-Hope, M.P. Owing to the inclemency of the weather there was a very meagre attendance.

The Chairman said that the School of Art established in connexion with the Museum had during the past year been more successful than ever in the national competitions. The classes had been very well attended, the number of students attending between the 15th of September, 1879, and July 10, 1880, being ninety-two in the evening classes, thirty-seven in the life class on Saturdays, and twelve in the ladies' class, making a total of 141. Nearly 500 students had now received instruction in the school in connexion with the Science and Art Department. The school had so greatly increased of late in regard to the number of students attending, that the premises, though large, did not afford proper accommodation, and the Council had, at the request of the art-master (Mr. Brown), and the curator (Mr. Randall Druce), determined to make certain alterations of the premises so as to obtain another class-room. The Council of the Museum had been able, during the past year, at a cost of more than 500*l.*, to secure the reversion of the lease of the premises, which were secured now for nearly half a century, and as the trustees would now hold directly from the Dean and Chapter of Westminster, their successors would no doubt be able to make good terms for the renewal of the lease. The exceptional expenditure to which he had referred had temporarily somewhat crippled the resources of the Museum, but no doubt times would improve, and the Council would then be able to carry on the work of the classes more efficiently than hitherto. The classes had been very successful, and it was a gratifying circumstance that for three years in succession students of the school had carried off one of the prizes offered by the Plasterers' Company. In 1878, Walter Allan gained the second prize offered by the company for a design for a centre ornament for a ceiling. In 1879 another student of the school, Andrew Garbutt, gained the first prize offered by the company for a twisted column, which was also awarded a gold medal in the national competition; and in 1880 Mr. William Kitson, a stone-carver, had gained the company's first prize for a modelled design for a picture-frame in a ceiling. This also, it was gratifying to be able to state, had been awarded a gold medal in the national competition, so that the school was amply justifying its existence.

Mr. Seddon then proceeded to present the prizes, which included: Second-grade certificates and prizes to Messrs. Robert Anning Bell, — Jones, and — Lawrence, for perspective; to Mr. Lawrence for freehand and model drawing; and to Mr. Blewett for geometry. For building construction, the first prize was awarded to Mr. Albert D. Smith, and the second prize to

Mr. Roland Roberts. National book-prizes were awarded to James Thomas for a design for muslin; and to William Kitson for a portrait-model from life. 4*l.* worth of books instead of silver medal were awarded to W. G. Thomas for a design for iron gates, and the same number of books (also in lieu of silver medal) to W. Catchpole for design for a candelabrum. A silver medal was awarded to Frank Brown for a design for a house; and a gold medal for modelled design for a picture-frame on ceiling (which also gained the Plasterers' Company's prize of 7*l.*) to William Kitson. Several other local prizes were given in connexion with the Museum and the school.

On the motion of Mr. Lomax a vote of thanks was accorded to Mr. Seddon for presiding and for past services to the Museum; and Mr. Randall Druce (curator and assistant secretary) and Mr. Brown (the art-master) having addressed a few words to the students, the meeting terminated.

LIVERPOOL ARCHITECTURAL SOCIETY.

THE fourth meeting of this Society was held at the Royal Institution, Colquitt-street, Liverpool, on Wednesday evening, January 12th, the President, Mr. Charles Aldridge, F.R.I.B.A., in the chair. After the usual routine business, the secretary announced that the sub-committee appointed to go into the merits of the measured drawings of the north vestibule of St. George's Hall, submitted by the students as recess work, had reported to the council that, in their opinion, those by R. Holt were the best, and those by C. R. Chidson were second; they also highly commended the drawings sent in by J. H. Havelock Sutton. The council had approved of the award of the sub-committee, and the prizes would be given accordingly. The death of Mr. George Goodall, one of the oldest members, was announced, and a vote of condolence with his widow was passed. Mr. Samuel Huggins, also a very old member, who had sent in his resignation owing to ill health, was elected an honorary member. A paper upon "Domestic Sanitary Economy" was read by Mr. J. W. Gibbs (Messrs. John Gibbs & Sons, sanitary engineers, of Liverpool), illustrated by carefully-prepared diagrams shown by the oxy-hydrogen light, descriptive of a system of ventilation as applied to a large dwelling-house, through the medium of Messrs. R. Boyle & Son's self-acting air-pump ventilator. Mr. Gibbs urged the importance of having a proper system of ventilation applied to the lavatories, &c., of dwelling-houses, and that a constant upward current should always be maintained in the shafts connecting the soil pipes and drains with the roof, and that this desirable object might be best attained through the above medium; otherwise the emanations from the coatings of the drain-pipes would, in the event of the water-basin of a trap becoming dry, or of a leak occurring in the drains, find its way into the apartments of the house, and introduce the germs of disease. A meeting of the Students' Class of Design and Construction was held previously to the ordinary meeting, when a large number of designs for "A Small Stable" were handed in. Mr. Arthur P. Fry was the visitor for the evening.

PONTEFRACT TOWN-HALL SCHEME.

THE Corporation of this borough held another specially-summoned meeting on Tuesday evening to consider a requisition signed by ten members, to take immediate steps in the re-building of the town-hall, &c. The majority at the last division, when the scheme was thrown over, now proposed that the old town-hall should be cleared away, and important street improvements carried out. This was met by an amendment that the Corporation should be empowered to spend a sum not exceeding 7,000*l.* out of the rates in the erection of an assembly-room, with surveyor's offices and extra police-cell accommodation, to include the purchase of additional properties,—the old vicarage and dispensary, and the architect's commission. The amendment was carried by eleven to ten votes, so that virtually the original scheme will now be carried out. The 3,000*l.* subscribed by the public will be devoted to the purchase of the property, and the 7,000*l.* to the building. Only a portion of the dispensary, for which the Corporation have paid nearly 1,500*l.*, will now be required, and the rest will consequently be for re-sale. The assembly-room, it is suggested, shall be slightly curtailed in size; and it is proposed to adopt the plans of "Straight and True," with some modifications. The main front will be brick instead of stone.

VIENNA TOWN-HALL.

THE Municipal Council of the Austrian capital has determined to decorate the interior of the Hôtel de Ville in an artistic manner. Amongst the principal features of the proposed embellishments will be three large paintings on the ceiling of the Grand Hall. The celebrated artist, Hans Makart, has already been appointed to execute these paintings. A colossal picture in the centre will represent the City of Vienna, with all her modern improvements. On the right will be a painting representing the Sciences and Arts, whilst on the left Commerce and Manufactures will be depicted. Around the Grand Hall will be placed statues of the principal local celebrities, and of men who have rendered eminent services to the Municipality. On the walls will be mosaics and medallions representing men of Vienna birth who have distinguished themselves in intellectual pursuits. The principal sculptors engaged for these works are Herren Weyer, V. Tilgner, Schmidtgruber, and Wagner. In the Hall of Presentation there is to be a grand battlepiece, painted by L'Allemand, representing the Siege of Vienna by the Turks. All the artists engaged in these works of decoration in the Vienna Hôtel de Ville are Austrians.

OBITUARY.

Mr. W. K. Broder.—It is our melancholy duty to record the death of a promising and talented young architect, Mr. William Kedo Broder, who fell a victim to that unfortunate practice, so common amongst men of business, of getting into a train while it is in motion. Mr. Broder fell between the platform and the carriage, and received injuries from which he died in a few hours. The deceased, who was a member of a Roman Catholic family, was chiefly engaged in buildings connected with that community. His two most important executed works are,—the Priests' House and Schools at Sunbury, a picturesque group of half-timber buildings, and St. Joseph's Roman Catholic Church, Brighton, a bold single-span church, vaulted in stone.* Mr. Broder had devoted a considerable amount of time to travelling about Europe; and one who was a frequent companion in his rambles has written to us of him as follows:—"A more sincere friend, a more genial and good-natured man, or a more devoted and enthusiastic artist, it has never been my good fortune to come across." Mr. Broder died on Saturday, January 8th.

A NEW BUILDING ESTATE.

THE site upon which stand the Roman Catholic Schools, at Richmond-road, West Brompton, built within the last few years by Monsignor Capel, is about to be converted into a building estate, by a company who have purchased it for that purpose. The site occupied by the schools, together with the grounds, occupies an area of about 4 acres in extent, and will shortly be covered with a large number of houses of a superior character. In order to clear the ground the materials of the schools were sold last week, by Messrs. Horne, Eversfield, & Co. The schools are now in course of demolition, preparatory to laying out the estate for building upon.

UNSANITARY HOUSES WITHOUT OWNERS.

THERE are just now a number of dilapidated houses near the banks of the river at Wandsworth which are not fit for habitation, but which are nevertheless occupied by poor people; and there seems a difficulty about either repairing or clearing them, as no owners for them can be found, and the tenants appear to pay no rents. The subject was brought under the notice of the Wandsworth District Board of Works at their last meeting, when it was stated that the houses had been condemned by the medical officer and surveyor, as being both dangerous and unsanitary, but that an obstacle stood in the way of their being repaired, as no owners could be found to claim them and become responsible for the work necessary to be done. In the course of a discussion which took place on the subject, the chairman observed that it was scarcely to be wondered at that no owners could be found for the houses, as, in his opinion, they were quite past repairing. It appeared to him very clear that the houses could be closed if they applied to a magistrate, and the clerk was directed to take the necessary legal steps, and apply to a magistrate accordingly, in order that the houses might be cleared of their occupants, and closed as soon as possible.

* Interior and exterior views of this church will be found in the *Builder*, vol. xxxix., pp. 314, 315.

TO PERSONS ABOUT TO BUILD.

SIR,—When a person is about to build, he or she employs an architect to make plans, elevations, and sections. This done, and approved by the employer, the architect then has to draw up a long specification, describing in detail all the work to be done and the different kinds of materials to be used. This part of the work complete, the employer asks what the cost will be. The architect replies, "I have not taken out quantities, but my approximate estimate is, say, 2,000*l.* You had better get a builder's estimate." Allow me to say that architects, as a rule, are gentlemen, and will not do anything shabby, and will tell you right off what can or cannot be done. The employer asks a builder for his estimate. The builder has to spend a great deal of time in viewing the site, ascertaining water-supply, haulage of materials, drainage, and, in fact, everything for the completion of the work. He has to read the plans, thoroughly study the specification, measure every part of the ground-work, and the mason's, bricklayer's, carpenter's, joiner's, plumber's, painter's, glazier's, and decorator's work. He has then to price these, which, perhaps, may contain 5,000 items. This takes a long time. Moreover, a man must be practically experienced to arrive at anything like an accurate estimate.

There are many who would jumble it over, sign the contract, and the first week begin scamping the work. The employer then finds, to his sorrow, that he is in bad hands, and the result is perhaps a very costly case of litigation.

Question.—I ask whether any person in any trade would spend twenty-one days in making calculations, exercising his talent and practical experience, taxing his brain, and then have his work hawked about among others of his trade? The employer says, "I have not told a single person what your estimate is, and my servants never speak about my business."

Suggestion.—When a person is about to build, let him employ the architect whom he knows to be a good man, and who has a list of good, substantial, and trustworthy builders on his books. Let him then decide upon the plans, and place himself entirely in the hands of the architect, who will at all times do justice to employer and employed. When the work is done, measure and value and pay according to quantity and quality. By these means he will have a good substantial building, and he will be ever friendly with his architect and builder. Moreover, if this system were adopted, it would save over fifty per cent. of builders from being in the Bankruptcy Court, and would, I know, save ninety-nine per cent. of the expensive cases of litigation.

BENJAMIN INKPEN.

THE PARKES MUSEUM OF HYGIENE.

SIR,—I should like to call attention to the fact that though we have in our midst so valuable an institution as the Parkes Museum, the avowed purpose of which is to disseminate sound ideas of sanitation, the bulk of the people are debarred from visiting it through its being open but a few hours in the day (from ten a.m. till two p.m.), when most men are engaged either in their professional or industrial callings. It would be a boon to the working-classes of the metropolis,—especially to those of them who are engaged in the building trades,—and the public in general, if it could be opened on a similar basis to the South Kensington Museum. Students of the Science and Art Department who are pursuing the study of building construction would be able to obtain valuable information, which at present they find it difficult to obtain from other sources.

J. F. WALKER, Bricklayer.

THE ARCHITECTURAL EXHIBITION AND THE ARCHITECTURAL ASSOCIATION.

SIR,—As my name has been referred to in connexion with the origin of the Architectural Association, will you allow me to say I think the band of students who associated themselves together in consequence of my letter to your journal in 1846 may fairly claim to have originated the idea of an architectural students' society; but at the same time, if it had not been for the Draughtsmen's Association, and the leadership of Professor Kerr, our scheme in all probability would have been a failure. Neither must it be forgotten that the A. A. D. gave us our first home, and its members that direction and advice which as a society of youngsters we so much needed.

Again, the idea of the Architectural Exhibition originated with the A. A. D., although the Architectural Association materially improved upon and developed the original idea; the Architectural Exhibition in its turn brought about the formation of the Architectural Union Company, of which it may be fairly said my old friend, James Edmeston, was the founder. I refer to this because in my opinion to the formation of the Architectural Union Company is in a large measure due the wonderful increase in numbers and influence of the present Architectural Association, particularly so because it enabled the Royal Institute and the Architectural Association to meet under the same roof, though as distinct societies.

One word more. Could not the Architectural Association revive the Architectural Exhibition? I am sure it would be a great boon to the profession, as well as to the public generally, if revived in a liberal and comprehensive spirit. I, as one of the committee at the time when the late Architectural Exhibition came to grief, would gladly co-operate in such a scheme, and doubtless other members of the committee would do so too. This ought to be a matter of small difficulty with a society numbering, I am told, nearly 800 members.

CHARLES GRAY.

WARMING AND VENTILATING.

SIR,—The apparatus for warming and ventilating manufactured by J. Weeks & Co., described and illustrated in your last week's issue, resembles somewhat an arrangement suggested and described by me in a series of articles on "Applied Hygiene," contributed to the *Universal Engineer* some time back. I am glad you have given prominence to the arrangement as devised by Messrs. Weeks & Co. It certainly is one of the simplest and most philosophical systems yet brought out, and deserves the consideration of sanitarians.

B. H. THWAITE, C.E.

RADIATION AND CONDUCTION.

SIR,—With my present knowledge or ignorance of the subject, the letter by Mr. Charles J. Bentley, at p. 58, is such a one as I would have liked to write. It expresses the ideas which occurred to my own mind on the matters he refers to.

As to the effect of heating by hot-water pipes upon the air, I had a very disagreeable experience yesterday forenoon, in church. Upon going in, the first few inhalations reminded me of drinking lukewarm water that had been smoked in the heating. In half an hour I had a slight headache, and was in purgatory until the end of the service, not caring to go out from where I was sitting. The church was in the country, and possibly, deficient ventilation, coupled with the ignorance of the attendant, had a good deal to do with the bad effect of the heating. People often forget that, as Professor Fleeming Jenkin puts it, we desire cool air to breathe, just as we like cool water to drink. A continuance of breathing air which has been heated by hot pipes or flues tends to produce blood-poisoning with some people. The air in this case is not only vitiated by burnt particles being suspended in it, but, as it seems to me, its electrical, magnetic, and chemical effects are also altered for the worse by coming into contact with the hot pipes,—and the more highly heated the worse,—just as the temper is taken out of a steel blade when it is passed through the fire. There is room for more real information being made public upon this subject than has yet been given.

As to Mr. Bentley's caution in connexion with the use of gas and coke stoves, his ideas are similar to my own. I was led to consider that without due precautions these might do great harm unless the products of combustion were securely carried off, so as not to contaminate not only the room the stove was in, but also other apartments near it. One cause that leads me to say so is that in apartments where the products of gas combustion from the gaselier were supposed to be carried off by the pipes put in for that purpose, these were often found to be a sham, owing to being led into the same pipe that ventilated the room, so that the products of gas combustion, especially when the fire was on, simply went up one pipe to go out of the room and down the other to come into it!

W. P. BUCHAN.

MILL BUILDING.

SIR,—With reference to the letter in your issue of last week on this subject, permit me to inform your correspondent, Mr. Jones Lloyd, that he will *gain* no power whatever by attaching a fly-wheel to his proposed water-wheel, a fly-wheel simply acting as a reservoir or store of force, but creating none of its own. It is very possible that a heavy fly-wheel might be desirable in working pumping-gear off the water-wheel, but the weight and position of such could be decided only by one in possession of full information of all requirements, and as a detail of the general scheme. If there is such a large margin of profit on corn-milling in Patagonia as Mr. Lloyd states, surely it would pay to have the advice of a first-class consulting mechanical engineer, whose fee would be saved many times over in the first cost of machinery. Sea-sand, if well washed by running a stream of fresh water through it, would be suitable for building work, but should be mixed with broken stone or rock for concrete.

With such a small head as Mr. Lloyd mentions, the use of a turbine or horizontal water-wheel would be very economical of power.

P. MUNDAY.

SURVEYOR'S PROBLEM.*

THE area found by Mr. Vine is over, and that of Mr. Eagles seriously under, the truth, which is very near 5331; and obtainable to any exactness with fewer figures than by logarithms, if we use a table of cube-roots, extending no higher than to 106, and the simple fact that when a quantity is increased or diminished in a very small ratio, its cube-root varies by one-third of that ratio. The simplest way of expressing the area was by

$$AC \cdot DE = (87 + \sqrt[3]{14^2 87}) \sqrt[3]{87^2 14}.$$

Now $14^2 87 = 17052$ = approximately $17000 + \frac{1}{340}$, and $87^2 14 = 105966$ = approximately $106000 - \frac{106000}{3200}$. The table will give us the root of 17000 = 25·713, and that of 106000 = 47·326. The former must be augmented by $\frac{1}{900}$ of itself, giving 25·739; and the latter diminished by $\frac{1}{9000}$, giving 47·321. Then AC = 112·739, which, × by DE or 47·321, gives 5330·923. No logarithms would get this result so quickly.

E. L. G.

WORTHY WORKMEN.

SIR,—I beg, with your kind permission, to record in your columns that close to my office a large building is now in course of erection, and although several bricklayers have been at work upon the job during the last two months, I have not heard a single oath or foul expression from any one of them. The works are carried on with the greatest decorum, and all the men appear to show great diligence in the discharge of their duties, even working as late as four o'clock on Saturday afternoon. There are folks who would argue from such a state of things that the men thus engaged are teetotalers, but such does not appear to be the case, as I have seen them using an adjacent public-house during meal-times with great regularity.

You will, I sincerely trust, pardon my not indicating the exact locality of the works, as I have no wish that so desirable a state of things as I have indicated should be interrupted by any interference.

ONLOOKER.

ARCHITECTS' ACTIONS.

HANCOCK *v.* BAKER AND SONS.

SIR,—Our attention has been called to the report of the above action in the *Builder* of December 18th, 1880. The report is somewhat incomplete. The gentleman therein referred to was not obliged to retire from business owing to illness, but was obliged to absent himself from his office owing to illness. That, as it seems to us, is quite a different thing to retiring from business.

The jury had to decide whether the plaintiff was entitled to recover, but the jury had no jurisdiction to decide whether the plaintiff or the estate of the former surveyor was to receive pay. The question as between the plaintiff and the former surveyor was not before the jury.

It is true that the jury gave a verdict for the plaintiff for the full amount of the claim; but it seems to us that your report ought to have gone on to say that the judge expressed an opinion that the verdict was entirely wrong and against the weight of evidence, and refused to give judgment. We may perhaps be allowed to state that the defendants have since obtained a rule *nisi* for a new trial.

We trust your well-known sense of fairness to insert this letter.

BLEWITT & TYLER,
Solicitors for Defendants.

* In Mr. Eagles's communication, last week, the symbol for "because" (·∴·), was accidentally substituted for that of "therefore" (·∴).

EMPLOYERS' LIABILITY BILL.

SIR,—I wish to know how a "Clerk of the Works" would be situated, in case of an accident on a building, with the "Employers' Liability Bill" as it now stands? Will one of your correspondents give some information on this subject?

P. SOLLAS.

THE FIRE AT MR. GEORGE MITCHELL'S.

SIR,—Probably you have not heard of the destructive fire which took place here (Brompton) on the 28th December, 1880. By some mistake the press had it next morning that there was a fire "at a marble-polisher's in Chapel-street, Knightsbridge," the fact being that the fire occurred in the back part of my show-room, abutting on my stables, which are in Chapel-place, Brompton. I should like one of your representatives to call and see the state of my late fine stock, and report the ravages of the fire, which, although scarcely noticed as a sensational fire, has damaged over 6,000*l.* worth of marble chimney-pieces, &c. As my customers can scarcely realise the great damage done, by which my contracts have been much delayed, and business generally impeded, it would oblige me very much if you would give a description of the great damage done by smoke, steam, fire, and smashing in the excitement.

G. MITCHELL.

*** Those who know Mr. George Mitchell will not need any further assurance than his own statement here made. We are very sorry indeed to hear of this disaster.

Books.

British Mezzotinto Portraits: a Descriptive Catalogue of these Engravings from the Introduction of the Art to the Early Part of the Present Century. Accompanied by Biographical Notes. By JOHN CHALONER SMITH, B.A., M.R.I.A., M. Inst. C.E. Part III. London: Henry Sotheran. 1880.

THIS is the third part of a large and laborious work, a former portion of which we noticed some time since. The author goes through the list of the mezzotintists in alphabetical order, giving a list of all their works, notes as to any various states of the plate, and a brief biographical notice of the subject of the plate. The inscriptions of the original plates are also given at full length. In a literary point of view the publication is a dry one enough; but in the fulfilment of its object it appears most thoroughly done, and represents an amount of laborious research for which the author must look for his reward in the blessings of many generations of future collectors, to whom "Smith's Catalogue" will probably become an indispensable book of reference. Such a work can hardly bring its author much immediate recompense, but its repute and its value to those concerned in the subject it deals with are such as will increase as time goes on. It is well for collectors that there are persons who are inspired by their interest in a subject to undertake this kind of useful but laborious and too often thankless task.

The present volume, which, as it goes down to the name of Vispre, we presume concludes the catalogue, contains as a frontispiece a reproduction of a very effective portrait of Charles II. by Sherwin, believed by the author to be the earliest mezzotint in existence. The three volumes, we may observe, are paged continuously, which is much better for reference in a work of this kind: it is, in fact, one volume published in three parts for convenience.

VARIORUM.

WE have before now spoken of the large expenditure made by some manufacturers in the production of trade-books. Messrs. C. & R. Light, the extensive cabinet-makers and upholsterers, of Curtain-road, Shoreditch, appear to have capped them all; for here we have before us a large folio volume, well bound, of "Registered Designs," comprising 430 pages, and nearly 2,000 items. Some of the drawings are, of course, representations of the ordinary kinds of furniture as now manufactured by wholesale, but the greater number are new, and for the most part of very satisfactory design. If another edition be published, we should advise Messrs. Light to cancel their present ugly title-page, and substitute something better, as it gives a wrong impression on opening the book. If good judgment be brought to the task of selection, this catalogue will be found a very useful book of reference.——"Domestic Plumbing and Water Service." By Wm. White, F.S.A., Architect, describes in a small compass several patented sanitary appliances, already mentioned in our pages, and in which the writer has a personal interest. The principles

involved well deserve careful consideration.——A new edition has been published of "Preliminary Introduction to Practical Mechanics," by the Rev. John F. Twisden, M.A. (Longmans). Some new chapters have been added, and the whole has been revised. It is a sound little book.——A new work, entitled "Chapters from the History of Old Saint Paul's," by Dr. W. Sparrow Simpson, editor of "Documents illustrating the History of Saint Paul's" (Camden Society), is in the press, and will be published shortly by Mr. Elliot Stock.

Miscellanea.

Compensation for Damage to Moors.—The arbitrator in the matter in dispute between Mr. Henry Garnett, Chairman of Quarter Sessions for the county of Lancashire, and the Corporation of the Borough of Lancaster, as to the amount to be paid by the latter for the abstraction of water from extensive grouse moors, the property of Mr. Garnett, has now made his award. The amount of the claim sent in was 30,000*l.*, and it was alleged that by taking away 1,500,000 gallons of water a day, as the Corporation was entitled to do, the moors, which altogether consist of 7,950 acres, by the side of Tarnbrook Wyre, near Lancaster, would be totally destroyed for the purposes of breeding grouse. Many eminent surveyors and sporting gentlemen were called, and also gamekeepers on the estates of several Scotch noblemen. None of the witnesses, however, placed the damage at so high a sum as the claim sent in, but several of them named sums varying from 18,000*l.* to 20,000*l.* On behalf of the Corporation, on the other hand, Mr. Mansergh, C.E., and other engineering witnesses and estate agents, testified that in their opinion the moors would be actually improved rather than deteriorated by taking away the water, as they were previously too wet, even for grouse; and that the only damage which Mr. Garnett would sustain would be that caused by the actual laying of the pipes, and by the disturbance caused to the grouse by the occasional visits of the workmen of the Corporation for the purpose of inspecting the works. This they did not estimate at more than 500*l.* The proceedings occupied fourteen days at the Institution of Surveyors, and the arbitrator, Mr. W. C. Gully, Q.C., paid several visits to the property for the purpose of personally inspecting it. The amount of his award is 3,500*l.*

The Smoke Prevention Acts.—The Hampstead Vestry has resolved to inform the Smoke Prevention Committee of the National Health and Kyrle Societies "That, whilst the Vestry and its sanitary department are fully alive to the importance of the subject, the evil produced by the comparatively few factories, bakehouses, &c., in this parish would hardly make any active interference with them advisable; that Hampstead suffered from London fogs and smoke when the wind was in certain quarters, and that the evil was undoubtedly on the increase; that little would be gained, therefore, by interfering with bakehouses whilst the half-million chimneys of private houses remained in their present condition; but that the Vestry will be happy to support any application to the Home Secretary for such reasonable amendment of the law as shall enlarge the existing Smoke Prevention Acts, and render them thoroughly effective."

The Fog and Smoke Question. — The problem solved so far as manufacturers are concerned! At the *Daily Chronicle* Paper Mills, where from 250 to 300 tons of coals are burnt weekly, there is an invention in use called M'Dougall's Mechanical Stoker, which not only consumes almost all the smoke, but effects a great saving in the amount of fuel required. Eight of the "stokers" may be seen in operation at Wheatsheaf Mills, Millwall Docks. Sixteen of these contrivances have been applied to eight very large boilers, and their success has equalled the utmost expectations that could be formed respecting them. In fact, Mr. E. Lloyd, the owner of the paper-mills, considers that this recently-improved "mechanical stoker" only requires to be seen in operation in order to ensure its coming into general use for boilers. With a view, therefore, to making so important an invention known, he has expressed his willingness to give an order to see the "stokers" at work to any one interested in such subjects.

Infraction of Building Bye-Laws.—At the Edmonton Sessions on the 12th inst., Andrew Nichols, builder, of Shacklewell-lane, was charged upon two summonses with violating the 106th bye-law of the Tottenham Local Board of Health, the material used by him as mortar in the construction of two houses in Daleview-road, Eastbournia, Stamford-hill, within the jurisdiction of the Board, not being of a character to solidly bind the bricks together. Mr. De Pape, surveyor to the Board, said he personally visited the houses on the 3rd of December, and took four samples of mortar (produced) from the brickwork. He also gave notice that the walls were in a dangerous state, and they had been partially taken down. The samples were handed to the justices, who with the greatest ease crumbled the so-called mortar into dust between their fingers. The Bench ordered the defendant to pay 5*l.*, and a continuing penalty of 2*s.* 6*d.* per day for forty days in respect of each house, —20*l.* altogether, and costs, intimating that they were determined to assist local authorities in enforcing their bye-laws.

Dunn's Literary Institute.—On the 13th inst. Mr. T. F. Dillon Croker, F.S.A., gave a charming entertainment, entitled "Selected Readings from the Writings of the Late J. R. Planché (*Somerset Herald*), with some Recollections of the Actors who appeared therein." Mr. Dillon Croker, with his comprehensive knowledge of the writings of one of our most prolific and accomplished dramatic writers, delighted his audience for more than an hour and a half with extracts from extravaganza, opera, comedy, burletta, comic drama, and farce, — extracts that were artistically selected and most dramatically rendered. Upwards of two dozen of Planché's best known stage productions were laid under contribution for selections, many of the extracts being characteristic from their charming wit, humour, and grace of the author's erudition and genius. Mr. Croker's imitations of the best known actors of his time have given the exponent distinction as an entertainer, and his imitations on the evening in question were perfect.

Kirkwall: Fire in a Church.—On Sunday morning, January 16th, St. Olaf's Episcopal Chapel was considerably damaged by fire. The heating apparatus was started in the morning, and the attendant, on returning from breakfast, found the floor of the vestry and organ-loft,—which form the roof of the stove-room,—on fire. Considerable damage has been done. As to the cause of the fire nothing is certainly known, but it is supposed that a water-trap on the main gas-pipe, in the vicinity of the stove, had been full of water which the severe cold had frozen, and burst on being thawed by the heat from the stove, causing a leak, to which the fire had communicated. The chapel is understood to be insured with the Northern Insurance Company.

Income and Expenditure of the City Commissioners of Sewers. — The accounts for the year ending September 29th, 1880, have just been printed. The general account shows that the income was 222,660*l.* 13*s.* 2*d.*, which after deficiencies, brought in 210,092*l.* 2*s.* 7*d.* The outlay included 40,500*l.* for paving; lighting about 16,000*l.*; cleansing and watering, 32,000*l.*; interest on money borrowed amounted to 11,000*l.*; and the School Board rate reached 84,000*l.* A sum of over 12,000*l.* had been spent on improvements as regarded dwellings, &c. The Metropolitan Board of Works charges to the City amounted to 77,000*l.*—*City Press.*

The Hull and Barnsley Railway.—On Saturday last, the 15th inst., Hull was the scene of an interesting ceremony connected with the proposed new railway from that town to Barnsley and other parts of the West Riding of Yorkshire, and in order that Hull might assume a festive appearance in honour of the occasion, the services of Messrs. J. Defries & Sons, of London, were called into requisition to arrange for the very extensive illumination that took place. Messrs. Defries achieved a great success, although they had but little more than a week in which to work.

Orkney.—The Parochial Boards of a number of the parishes in the county of Orkney have joined, and determined to erect a combination poor-house at Kirkwall. A very suitable site has been procured on the estate of Glaitness, extending to two acres, and situated within the burg drainage and water district, at a cost of 200*l.* Mr. T. S. Peace, architect, of Kirkwall, has been selected to prepare the necessary plans for the works.

Art Loan Exhibition at Chelmsford.—The Essex Art Loan Exhibition, consisting of pictures painted by Essex artists in oil or water colours, also of views in the county painted by other artists, together with engravings relating to the county, has been on view this week, in connexion with a *soirée* and other meetings under the auspices of the Essex and Chelmsford Museum. It will close this Saturday, the 22nd.

The Parks.—Her Majesty's Office of Works has entrusted Mr. Anthony Waterer with the providing and planting a large number of rhododendrons and azaleas in Hyde Park during the approaching season. The plants are unusually well budded, and, with fair weather, it is believed they will make an unprecedented display in Rotten-row.

TENDERS

For the erection of St. John's Wood High School for Girls. Mr. E. C. Robins, architect:—

Ansell	£8,528 0 0
Nightingale	8,381 0 0
Marriage	8,364 18 8
Adamson & Sons	8,300 0 0
Wall Bros.	8,213 0 0
Manley	8,080 0 0
Bywaters	8,073 0 0
Brass	8,025 0 0
Clemence	7,967 0 0
McLachlan & Sons	7,734 0 0
Lathey Bros.	7,700 0 0
Colls & Sons	7,680 0 0

For pulling down and rebuilding the first quarter of the central block of Smedley's Hydropathic Institution, Matlock Bridge. Mr. G. E. Statham, architect. Quantities by the architect:—

Mason's, Slater's, and Plasterer's Work.

Thompson & Stone, Bristol	£3,430 0 0
Urmson, Liverpool	3,142 0 0
Fox, Wirksworth	3,067 0 0
Naylor, Clay Cross	2,950 0 0
Walker & Sons, Wirksworth	2,851 10 0
Dennett & Ingle, Nottingham	2,647 0 0
Hewitt, Leicester	2,640 0 0
Beck, Matlock	2,613 0 0
Davies & Mawdsley, Manchester	2,608 0 0
Bridge, Matlock	2,558 0 0
Neill & Sons, Manchester	2,535 0 0
Askew, Matlock (accepted)	2,531 19 0

Carpenter and Joiner's, Plumber and Glazier's, Iron-founder's, Gasfitter's, and Painter's Work.

	Staircase, &c., in Oak.	Staircase, &c., American Walnut.
Dennett & Ingle	£3,637 0 0	£3,637 0 0
Naylor	3,600 0 0	3,700 0 0
Urmson	3,459 0 0	3,459 0 0
Davies & Mawdsley	3,455 0 0	3,455 0 0
Neill & Sons	3,360 0 0	3,610 0 0
Thompson & Stone	3,345 0 0	3,440 0 0
Eyre & Rogers, Buxton	3,321 0 0	3,341 0 0
Sampson, Dukinfield	3,107 15 0	3,107 15 0
Prime & Wood, Buxton	3,033 0 0	3,384 0 0
Hewitt	2,935 0 0	3,145 0 0
Beck	2,950 10 0	2,971 10 0
Statham, Matlock (accepted)	2,800 0 0	3,000 0 0

For the erection of a pair of shops at Matlock Bridge, for Mr. H. G. Hartley. Mr. G. E. Statham, architect:—

Mason, Slater, and Plasterer's Work.

Beck	£725 19 0
L. Bridge	625 0 0
A. Bridge	623 0 0
Wall	605 10 0
Askew (accepted)	603 0 0

Joiner, Plumber, Glazier, and Painter's Work.

Knowles	£595 0 0
Statham	530 0 0
Beck	520 0 0
Robinson (accepted)	513 0 0

For new schools and mission-room, St. John's Church, Oxford-road, Kilburn. Mr. John Lowe, architect:—

Jackson & Graham	£3,473 0 0
French	3,463 0 0
Balsam	3,288 0 0
Coulter	3,249 0 0
Scott	3,197 0 0
Battley	3 098 0 0
Jones	3,079 0 0
Sawyer	2,981 0 0
Childs	2,890 0 0
Higgs	2,718 0 0
Parker	2,689 0 0
Osgood	2,680 0 0
Johnson	2,650 0 0

For the erection of the St. George's-road Board Schools, to accommodate 680 children, Newington, Hull. Mr. W. Freeman, architect. Quantities supplied:—

Habershon & Son	£4,356 14 0
Hockney & Liggins	4,290 0 0
Spence & Co.	4,255 0 0
Brown	4,215 13 0
Morrell	4,206 7 0
Wilson Bros.	4,204 13 3
Berry	4,140 0 0
Goates	4,100 0 0
Giles	4,065 0 0
Sergeant	4,035 0 0
Skinner (accepted)	3,948 0 0

For Wharf Wall and Foundations, Graham-street and Regent's Canal. Messrs. Ford & Hesketh, architects:—

Docwra & Sons	£1,340 0 0
Lawrence	1,159 0 0
Munday (accepted)	1, 14 0 0

Alterations and addition to the "Old House," Mickleham. Messrs. Ford & Hesketh, architects:—

Nightingale, Reigate	£1,889 0 0
Conder, London	1,298 0 0
Batchelor, Leatherhead (accepted)	1,069 0 0

For new factory, Fore-street, Exeter, for Messrs. Lloyd & Son. Messrs. C. Shoppee & Sons, architects. Quantities supplied by Mr. H. Shoppee:—

Brass, London	£12,478	0	0
Pethick & Co., Plymouth	10,984	0	0
Stephens & Sons, Exeter	10,484	0	0
Jones & Co., Gloucester	10,290	0	0
Clark	10,289	0	0
Claridge, Banbury	10,095	0	0
Stephens & Bastow, Bristol*	9,859	0	0
Brand & Co., London	8,300	0	0

* Accepted.

For new roads, pipe sewers, and surface-water drains on the British Land Company's Park Hill Estate, Finchley. Mr. Henry B. Mitchell, surveyor:—

Keeble	£5,227	0	0
Killingback	4,995	0	0
Crockett	4,979	0	0
Acock	4,896	0	0
Jackson	4,888	0	0
Pizzey	4,888	0	0
Bloomfield	4,860	0	0
Dunmore	4,859	0	0
Thompson & Son	4,848	0	0
Harriss	4,760	0	0
McKenzie & Co.	4,485	0	0
Wilson	4,420	0	0
Peill (accepted)	4,195	0	0

For additions and alterations to the Richmond Hospital, Surrey. Quantities by Mr. W. H. Barber. Mr. F. J. Brewer, architect:—

Messom, Kew	£3,695	0	0
Hampton, Richmond	2,550	0	0
Hinkerbotham, Kingston	2,545	0	0
Sims, Richmond	2,450	0	0
Carless, Richmond	2,363	0	0
Sweet & Soder, Richmond	2,362	0	0
Blasby, Kew	2,290	0	0
Malan, Kew	2,245	0	0
Seal Bros., Richmond	2,197	0	0

For stables at rear of 41, Warrior-square, Hastings. Messrs. Cross & Wells, architects. Quantities supplied:—

Jones, Gloucester	£718	0	0
Cruttenden, Hastings	599	0	0
Rodda, Hastings	585	0	0
Homersley, Hastings	575	0	0
Vidler, Hastings	572	0	0
Geary, Hastings	561	0	0
Higgs, London	534	0	0

For the erection of a billiard-room and out-buildings, and other improvements, to Park-hill House, Streatham, for Mr. Henry Tate. Mr. E. R. Robson, architect:—

Hook & Oldrey	£3,831	17	0
Tongue	3,798	10	0
R. & E. Smith, Streatham	3,550	16	11
Boyce	3,525	0	0
Higgs & Hill (accepted)	3,332	0	0
Gillow & Co.*	1,250	0	0

For sanitary works, and plumbing:—

Beard, Dent, & Helyer (accepted)...	956	10	0

* For billiard-room only.

For rebuilding Chafford Bridge, Penshurst, for the County of Kent. Mr. Frederick W. Ruck, Surveyor. Quantities by Messrs. Ruck, Son, & Smith:—

Jordan, Edenbridge	£1,674	0	0
Williams, London	1,485	0	0
Punnett & Sons, Tunbridge	1,241	10	7
Wallis, Maidstone	1,079	0	0
Bingham, Headcorn	997	0	0
Ball & Gammon, Gillingham and London (accepted)	847	10	0

For additions to malthouse at Maidstone, for Messrs. Holmes & Style. Messrs. Ruck, Son, & Smith, architects. Quantities supplied:—

Naylar, Rochester	£1,247	0	0
Vaughan, Maidstone	1,235	0	0
Cox Bros., Maidstone	1,215	0	0
Calland & Son, Rochester	1,198	0	0
Avard, Maidstone	1,197	0	0
Wallis & Clements, Maidstone*	1,177	0	0

* Accepted.

For additions to Rock House, Kingsand, Plymouth, for Major-Gen. Boyle, C.B. Messrs. Clifton & Flint, architects:—

Taylor & Son, Stonehouse (accepted)...	£900	0	0

For alterations and fittings to Nos. 4 and 6, Cannon-street, City. Messrs. Perry & Reed, architects. Quantities by Mr. W. J. Worthington:—

Clarke & Bracey	£2,789	0	0
Trollope & Sons	2,734	0	0
Brass	2,538	0	0
McLachlan & Sons	2,316	0	0

For new road and drains, on the East Ham Estate, for Mr. W. Hitchman:—

Dunmore	£795	0	0
Harris	699	0	0
Thompson	600	0	0
Wilson	599	0	0
Pizzey	588	0	0
Woodhams	535	0	0
Peill	488	0	0
Jackson (accepted)	432	0	0

For new dead-house, for the Churchwardens of St. Anne's, Limehouse. Messrs. A. & C. Harston, architects:—

Walker (accepted)	£368	14	0

For new railing, &c., to part of churchyard:—

Walker (accepted)	£165	0	0

TO CORRESPONDENTS.

J. W. T. (cancelled, having appeared elsewhere).—J. D. C. (already mentioned).—S. Bros.—P. M.—G. R. S.—A. A.—S. T.—T. S.P.—G. C.—J. & W.—S. & R.—D. W.—Mr. T.—W. W.—J. R.—H. B. M.—C. R.—T. C. C.—I. & H.—C. M.—F. W. H.—W. F.—Mr. R.—W. G. K.—H. H. G.—C. M.—T. E.—R. R. M.—A Reader.—J. G. & Son.—H. W. M.—R. G.—C. G.—F. (no).—S. T. (shall appear).—P. J. D. (next week).—J. H. B. (next week).—W. G. D. (next week).—T. R. S. next week).—W. L. D. (next week).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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